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Technical Instruction in Woodwork.

AT first sight it might seem that books must be of very little value in teaching or in assisting in teaching the craft of working in wood, but we have before us several books* on various aspects of woodworking which possess a value for both teachers and scholars. Technical instruction in woodwork, as now practised, is given for two distinct purposes: first, for the *education* of hand and eye without any necessary intention of the skill in woodwork obtained being exerted for a means of livelihood, and, second, for the *training* of a craftsman so that he may the better be enabled to earn his daily bread. The recent adoption of manual training as a part of education in higher grade or secondary schools, has, or should have, always in view the first only of these purposes, but if we were to judge merely from Mr. Barter's "Woodwork," or Mr. Degerdon's "Grammar of Woodwork," we might be inclined to feel that the short-sighted utilitarianism of the average Englishman, who wants his boys to get what he calls practical knowledge, has already operated injuriously on the character of the manual training now given in schools. For the school teaching of boys, whose future careers will certainly widely differ, and are for the most part undetermined, there can be no question that the system of manual training to be preferred is that which will give the fullest development to hand and eye. As Mr. Ricks very rightly says in his preface to Mr. Barter's book, "the essence of manual training lies in the *practice* and not in the *production*; in the *doing*, not in the *thing* done!" and its purpose is "to awaken and train the artistic faculties, and direct the child's instincts towards the beautiful and true." This being so, the system of manual training in woodwork advocated by Mr. Barter and Mr. Degerdon has for competitors not only drawing and modelling in clay, both of which have their champions, but also the Swedish Slöjd, which we have seen at work in some English schools. As between drawing and modelling on the one hand and some form of woodwork on the other we think it may be fairly claimed that woodwork not only bears the palm for superiority of interest to the scholars in the generality of cases but will, when rightly conducted, give better education to hand and eye in a limited time. The superiority of interest results partly from the absence of drudgery which is almost an inevitable concomitant of early drawing lessons, and still more from the active physical exercise and the greater change from ordinary school work. The better education in a limited time must also be admitted by impartial observers, although it by no means follows that the highest level reached by means of woodwork will in any way attain to the fullest results obtained by an extended course of instruction in drawing and modelling.

Taking it for granted that for the manual training, or, more properly, the education of hand and eye of boys at school, some form or other of woodwork is most generally advisable, we may next consider what system of instruction is likely to give the best results, bearing always in mind that the best result is not the production of a number of young amateur carpenters, joiners, or wood-carvers, but the development of the hand and eye of all the scholars, so that they may have a better appreciation both of beauty and truthfulness in form, greater deftness of hand and wrist, and a readiness of resource to fit the means to the end in any manual occupation, artistic or utilitarian, which may come to their lot either as work or pastime in future life.

The various competitive systems in vogue in this country may be taken as wood-carving, the Swedish Slöjd, and the English Sloyd, as the systems set forth by Mr. Barter and Mr. Degerdon may be called. The case for the English Sloyd is well argued by Mr. Barter, though naturally from an *ex-parte* point of view. The disadvantages of wood-carving, as set forth by Mr. Barter, are, insufficient variety of tools, difficulty of grading the exercises, cramped position of the pupil, the teaching of "only art drawing, and of that but a small amount." Of these objections that of the cramped position may, to a partial extent, be admitted, though even this may be lessened by a judicious selection of exercises. The difficulty of gradation and limitation of drawing will neither of them be admitted by anyone who has made practical acquaintance with the immense range of carving studies, from simple "chip carving" to figure work, that can be successfully taught. The limitation of the variety of tools to the numerous forms of chisels and gouges employed in carving introduces us to a strong point of difference between the English Sloyd and other forms of woodwork with which we shall deal presently. On the other hand it must be admitted, by all impartial observers, that wood carving is invaluable as a means of producing suppleness of hand and wrist, and as a training in the value of curved line and of varied planes of surface; that is of beauty of form, light, and shade. and so of the artistic perception. Inasmuch as the English Sloyd, advocated by Mr. Barter, conflicts principally with the Swedish Slöjd, we find the objections to the older and foreign system forcibly stated. Firstly, it is alleged that "the Slöjd system is distinctly defective in the association and the quality of the drawing involved. The work is done more from the model than from the drawing of the model, and too many of the models give the most indifferent opportunities for drawing lessons." On comparing a set of the Slöjd models with those illustrated by Mr. Barter, we are struck with the fact that those of the former system possess forms which cannot be adequately drawn in a geometrical fashion, by reason of the predominance of curved surfaces. The earliest model is a small pointer of circular section of diminishing diameter, whilst the spoon, to which Mr. Barter refers as a "prominent model," is wholly composed of curved surfaces of constantly changing curvature. This model Mr. Barter especially objurgates from the length of time taken in its production, which he states is from seven to nine hours for a man, and fourteen to eighteen hours for a boy. This is condemned as furnishing only one drawing lesson, but we think that the train-

* "Woodwork" (The English Sloyd), by S. Barter; Preface by George Ricks, B.Sc.Lond. London: Whittaker & Co. "The Grammar of Woodwork," by Walter E. Degerdon. London: Macmillan & Co. "The Principles of Pattern-Making," by a Foreman Pattern-Maker. London: Whittaker & Co. "The Carpenter and Joiner," by various Experts and Authorities; Edited by Robert Scott Burn. London: Ward, Lock, Bowden, & Co.

ing of that one drawing lesson in the sense of form and the value of refined gradation of curved surface is invaluable, and supplies an element in which the whole series of lessons included in the English Sloyd is deficient. Any pupil who has once produced accurately such a model has thereby learnt as much as is possible to be learnt from woodwork of the meaning and value of form and of the right judgment of truthfulness of line. Both hand and eye must be very highly trained when such work as this model is possible to a student. Another point on which Mr. Barter speaks strongly is the class of tool employed, and here he particularly falls foul of the famous Slöjd knife. As a counterpoise to the knife is advocated the chisel, but it is apparently forgotten that a knife is always to be found in the pocket of an English schoolboy and not a chisel, and that so far from the knife being an "unfamiliar" tool, it is the chisel rather which would be so designated by the majority of the pupils. Again, a knife is capable of being used for the production of curved surfaces far more readily than a chisel, but here once more we touch on a vital point of difference between the Swedish and the English system. Another objection raised is that "in the more advanced Slöjd models the use of too many tools is involved." This is somewhat inconsistent reasoning for an advocate who condemns carving for its paucity of variety in tools.

Having thus dealt with the objections raised to the competitors of the English Sloyd we may now touch upon what appear to us as inherent defects in the methods advocated by our English teachers. First, the tools. These are wholly the usual tools of the carpenter and joiner, and the system appears to attach too much importance to teaching boys the use of the mechanic's tools rather than the training of hand and eye in a general sense. Sawing, planing, paring, and the use of the centre-bit are, in fact, the extent of the knowledge obtained, in addition to some simple geometrical drawing. Accuracy and precision, it must be admitted, are well inculcated, but this accuracy and precision are the result of the use of rule, compass, and square, not of correct unaided judgment of eye. In this respect, therefore, as a training of the eye, English Sloyd is distinctly inferior to both carving and the Swedish Slöjd. The limitation of the models to straight lines and, with hardly any exception, right planes and circular curves, is of far less value as an education of the eye than the gradated curved surfaces of the latter systems. In these two points, therefore, lie the deficiencies of the English Sloyd, the limitation of the tools to those of the mechanical work of the carpenter and joiner and the limitation of the models to geometrical forms. The system is, in short, an admirable preparation for the workshop, chiefly for that of the carpenter and joiner, but also, though to a lesser extent, for that of the engineering mechanic. Apart from this, it is deficient in the education of the hand in deftness and suppleness, of the eye in accuracy, and, above all, of the artistic sensibility.

Taking the English Sloyd system as it stands, we have nothing but praise for the admirable way in which it is set forth in Mr. Barter's book, which should be in the library of every young carpenter and joiner, and contains information, important for every young architect, very clearly and concisely expressed. The various kinds of timber and the tools employed by the carpenter are very well described, and the proper methods of sharpening and using tools are made perfectly intelligible by photographic illustrations of the tools in the hands of a workman. The series of models of which the system of teaching consists, is well chosen for the attainment of the object in view, the skilful use of the joiner's tools, and the knowledge obtained, would be useful either for a professional or an amateur mechanic in wood. It is, however, beside the mark for Mr. Barter to leave it to be inferred that the thirty models which he includes in his series could be executed by any schoolboy in the time of 330 hours, which, in his introduction, he states is all that can be allowed from ordinary school work. There are, too, several models given which, in our judgment, would occupy a boy even longer than the Swedish Slöjd spoon to which we have before referred, and we must conclude that the English Sloyd has no advantage over the Swedish in point of time required for the course.

We have endeavoured to judge fairly between the English Sloyd, as set forth by Mr. Barter, and the Swedish system, and have taken care to investigate this latter before coming to the opinions we have expressed. Mr. Barter's book is so charming that at first we were fascinated by the author's plausibility, but the severe strictures passed upon other systems naturally suggest the thought that a somewhat partisan view is taken of the competitors of the English Sloyd.

To the architect the final chapter on the workroom and its fittings is particularly valuable at a time when so many technical institutes are springing up around us.

Turning now to the system of manual woodwork instruction advocated by Mr. Degerdon, and based upon the practice of the Whitechapel Craft School under his direction, we find practically the same objects kept in view as by Mr. Barter, with this difference, that as the time at the disposal of the teacher is presumed to be limited to 120 hours, the course is shorter, and the exercises simpler. The twenty-one lessons included in the course would, however, require very sharp work on the part of a boy to complete in 120 hours. We have the same results of the training as in the former case, though in a lesser degree, a certain amount of skill in the use of the simpler tools of the joiner, a certain amount of knowledge of simple geometrical drawing, but the same reliance on gauge, rule, and square, and, consequently, the same limited education for the eye as well as for the hand. The means employed and the manner in which they are set forth are admirable for the limited purpose and scope in view, but there is not that satisfactory training for hand and eye that should be the first object of manual instruction, and which is quite unattainable without less reliance upon tools and instruments of measurement.

In *The Principles of Pattern-Making* we have a strictly technical work on a special branch of woodwork, produced not for any purpose of general information, but for the special advantage of a particular specialised craft. Addressed to and intended primarily for the young pattern-maker, it is of considerable interest and value to the engineer, the architect, the builder, or whoever has to design or determine the form of metal castings. By a careful perusal of this work much may be learnt of the practice of the foundry and of the points which tend to increase or decrease the cost of castings, to augment or lessen the strength of cast work, and to lay the foundation of that knowledge of technique which is at the basis of all design, whether æsthetic or utilitarian. The point of view from which the subject is treated being, however, rather that of the engineering pattern-maker than the sculptor, we must not expect, nor do we find, that much notice is taken of ornamental metal-casting. The first principles and materials are explained lucidly, and the short account of the tools used by the pattern-maker will be useful for the tyro. The various methods of jointing patterns, both for the purpose of rendering them capable of withdrawal from the moulds, and in order to obtain the necessary strength for the rough usage of the foundry operations, and for resisting the variations of temperature and humidity to which they are subject, are well explained by the description of the actual process of making patterns for definite purposes; and, though it would be manifestly impossible within the limits of such a work to describe all the possible examples with which a pattern-maker might have to deal, ample sufficient instances are given to include the fundamental principles, so as to enable the young workman to apply them to any particular piece of work. Not the least valuable part of the book is the glossary of terms used in the foundry and pattern-shop, which will be found serviceable not only to the pattern-maker, but also to the designer of cast-metal work. This book we may, in short, characterise as a model work for the technical craftsman.

A number of papers which have appeared from time to time in the *Technical Journal and Industrial Self-Instructor*, and are now incorporated in the work entitled "The Carpenter and Joiner," may be taken as an illustration of the kind of information that is to assist the self-instructing mechanic to supplement the deficiencies of the present-day system, or, perhaps more correctly, we ought to say, lack of system, under which the modern carpenter and joiner picks up his trade now that the old-fashioned method of apprenticeship has, practically, passed away. We are glad to note that an attempt is made to explain to the young carpenter the *raison d'être* of the particular forms which various joints and other parts of timber construction have assumed for statistical and mechanical reasons, whether arrived at by process of thought or by experience, as it cannot be too often remembered that the point in which the modern British workman is, above all, apt to be deficient, is an intelligent and rational comprehension of the principles which underlie his daily practice. It is not, however, of real advantage to explain these principles by hypothetical accounts of primeval woodwork, especially when the hypotheses that are stated as historic facts are, as in the case we are considering, archæologically incorrect.

Those who prepare books of instruction for the use of operative workmen, whose general education, even in these days of Board Schools, is usually somewhat defective, and who are unable, in many cases, to verify the truth of dogmatic assertions, should always be particularly careful that such assertions should be absolutely and rigidly true. Thus, to say that "the trussing of beams has for its principal object the providing against the tensile strain to which it may be subjected," obscures and ignores the fact that a truss, properly so called, necessarily entails that at least one of its members shall be subject to a tensile strain. Of course, the trussing of beams is intended to strengthen them against cross strain, and it is a pity to lead the mind of a young carpenter to confuse tensile and cross strain. Nay, more; we might use the words of Napoleon and say, "it is worse than a crime, it is a blunder."

The work now before us contains so many instances of modes of construction not universally known, and but infrequently described, that it is perhaps a little hypercritical to say that there are some omitted which ought to have been included; but the producers of new works for the technical craftsman should always endeavour to introduce as much modernity as possible, to be, in current phrase, up to date. Thus, in describing the strengthening of beams, account might be taken not only of Delorme's method of building up curved beams by layers of boards one above the other, but also of the cognate device of putting the boards side by side. Again, the simple means of building up a deep beam, used sometimes in America, but little known in this country, by placing two beams, of moderate depth, one over the other and connecting by boards nailed diagonally to their sides, is a cheap and very strong piece of construction. In the use of herring-bone strutting, the practice of putting the crossing battens flatwise instead of upright is one which is scientifically superior to the ordinary method in the stiffening of our thin and deep modern joists.

As a further instance of archæological inaccuracy we find repeated the popular

fallacy that Mansard (or Mansart) invented the form of roof generally known by his name, whereas, just as in the case of Palladio and the pulvinated frieze, the truth is, that he popularised the form of roof already invented. In speaking of mansard roofs we are reminded of a point in their actual working which is important to the carpenter, the method of finding the "cuts" for the rafters, especially jack rafters, when hips are introduced. One of the details which distinguish the expert carpenter from the bungler is the knowledge of solid geometry which enables the skilled workman to save so large an amount of time as compared with the tyro.

Every book purporting to be a means of instruction for the worker in wood should, one would think, give a clear, and, as far as space permits, a full account of the various woods that are likely to come within the province of the worker, or, at the least, should refer him to other and fuller sources from which he can get the necessary information. Instead of discoursing at length, in vague terms, on the value of a knowledge of different kinds of wood, it would be better to give some substantial hints of that knowledge, which can hardly be said to be done, when, for example, the account of mahogany is limited to twenty-five words.

In any account of the work of the joiner, as distinguished from that of the carpenter, an explanation of the various ways of forming joints or connexions between different parts is of paramount importance, and we are pleased to see, in the work before us, that this vital subject is well and adequately treated. The description of staircasing and handrailing is also good as an introduction to perhaps the most difficult work of the joiner, and reference is made to other works by which the young aspirant may further pursue his studies. The work of the joiner cannot be said, however, to be in any sense fully treated, though, as an introduction thereto, the quality of the information given is satisfactory.

Design plays a more prominent part in joinery than in carpentry, and it is in the matter of design that so many books fail just as does the one we are now taking for our text. It is a matter much to be regretted that this should be so, as every bad design which sees the light, whether on paper or in actual execution, vitiates the taste of our countrymen in general, and renders them still less averse to the toleration of ugliness, which even more than the want of appreciation of beauty is, as Mr. Gladstone has pointed out, and as all careful observers must admit, a remarkable trait of the British mind. In the present case the character of the designs is not only bad, but the badness has not even the feeling of modernity, it is the badness of the stop-chamfer period of design, and hence is antiquated and out of date. The ideal work of reference and instruction for the carpenter and joiner has, we fear, yet to be written, and the modern Nicholson must be a man combining very varied abilities, as well as a wide range of knowledge, such as are possessed by very few men indeed who have sufficient time at their disposal for the purpose.

ARMAGH CATHEDRAL.—We hear that Mr. Thomas Drew, R.H.A., F.R.I.B.A., of Clare-street, Dublin, has been appointed Consulting Architect to Armagh Cathedral, in succession to the late Mr. Carpenter.

ORDNANCE SURVEY MAPS.—We are informed that the Board of Agriculture desire to give notice that arrangements have recently been made by which the latest issues of the Ordnance Survey Maps on the 1-in. and 6-in. scales have been made available for inspection by the public at the Offices of the Board at 3, St. James's-square, S.W. Changes in the boundaries of boroughs, of Local Government districts, and of parishes, will be recorded on the 6-in. maps as soon as possible after they have been authorised, and a complete set of the index maps and indices of all Ordnance Survey Maps and publications will be kept in hand for reference. The Board have reason to believe that the facilities for inspection thus afforded will be found to be of general public utility.

COLOUR DECORATION AT THE CHICAGO EXHIBITION.

PERHAPS the most satisfactory thing in connexion with the colour decoration at the Chicago Exhibition lies in the fact that the exhibits are all on the buildings and in the places for which they were designed, and they are all executed by American artists acting in concord with the architects of the buildings, and under the supreme control of Mr. F. D. Millet, the Director of Colour, who is himself, besides being a painter of no ordinary merit, a capable decorative artist, as his work on the buildings show. It may be remembered that his picture was purchased by the Chantrey Bequest last year, and he is a frequent exhibitor to our own Royal Academy, besides being a member of the Royal Institute of Painters in Water-Colours. The Assistant Director of Colour is Mr. W. T. Turner, also an artist of the best standing in the States. Under such leadership, and acting in concert with each other, it might have been expected that decorative art would have been well represented at the Exhibition, especially as money, although not too liberally supplied, was granted with sufficient generosity to admit of a good show being made. It was fortunate, too, that the buildings seem in most cases to have been designed for colour treatment. They are laid out on Renaissance lines, with their chief points emphasised by pavilions containing domes or tympani eminently suitable for such treatment, or which have colonnades whose inner wall lends itself admirably to colour treatment, which, while placed in these positions is sufficiently protected from the weather, and also acts as a background for the architectural features in front of it. Decorative art was exhibited to a large extent at the late Paris Exhibition, as in the Central Hall of the Fine Arts Building, by contributions sent by various artists, but it had this great drawback, that it was sent as an oil picture might be sent to a picture show, and could not form part of the building which it was intended to decorate. This was only in the main, however, for the great central dome was elaborately finished in fresco and also other parts of the main buildings; but no such general scheme seems to have been adopted as at Chicago, and this, no doubt, was partly on account of the architecture adopted, which did not lend itself to the application of colour.

It is fortunate that the American decorative artists have risen to the occasion, and have shown that they are able to cope with problems of decorative art so as to be in harmony with the architecture which it adorns, and it is needless to say that henceforth decorative art as an aid to architectural effect should take its stand along with sculpture and the other allied arts, and that American decorative artists should be a factor in American art.

Mr. Millet seems to have been fortunate in surrounding himself with a band of men who have had some considerable training in France and Belgium, and who besides have been employed in America on certain modern buildings in which the employment of decorative art has been seriously undertaken; for instance, Mr. Blashfield, who has executed work on the Manufactures Building, as will be noted, studied with Mr. Millet himself in Paris and Antwerp, and has decorated the sumptuous Hôtel Waldorf at New York, lately erected by Mr. Astor, the millionaire; also a new hotel in Florida, and other large buildings.

The most monumental building on the grounds, viz., the Administration Building, by Mr. Hunt, is, perhaps, the least fortunate as to its colour decoration of all the buildings. The interior has been carried out by Mr. W. L. Dodge, and, as before hinted at, the poor result may be because of the structural reasons necessitating the use of electric light during the execution. This may, perhaps, account for the light key which has been adopted, and which is not sufficiently strong for a monumental building of this proportion; the general treatment of the ground work is light buff, with the mouldings picked out in gold. The panels over the great circular arches contain reclining white angles on a light blue ground, supporting a name panel between them above in the loggia story, and forming the drum of the dome. The space between the pilasters is painted a light red terra-cotta colour; while the inner dome is treated in light blue and gold, and has a washed-out appearance; while beyond in the outer dome, and seen through the 50-ft. opening of the inner one, is a realistic representation of Apollo distributing garlands to figures representing Arts and Sciences, which are grouped around him. This, no doubt, was a difficult space to treat, especially as it is impossible to see more than a quarter of the composition at one time from the ground level; then why take a subject which requires you shall see it all before you can understand it? Some subject simpler in its composition and broader in its treatment might, we think, have been more satisfactory.

The outside of the building has, in conformity with the scheme formulated by the architects of the buildings abutting on the Court of Honour, been left white, with the exception that the wall behind the colonnade is painted a rich Pompeian red, which serves in a fine way to show up the Ionic columns to the loggia story, and to give light and shade to the whole design.

There is only one building which has been designed from its very inception and carried out for the purpose of colour decoration, and that is the Transportation Building, by Messrs. Adler & Sullivan, where the whole interior surface is so treated; this we shall treat of presently. The Manufactures Building, by Mr. Post, of New York, seemed to lend itself admirably to the purpose of colour decoration in its accepted usage. At well-defined points in the covered ambulatory which encircles the building, and which is just about a mile in length, are eight domes, two on each façade; and eight semi-circular tympani, two at each angle, which lend themselves specially to the treatment of subjects dealing with manufactures and liberal arts. Eight artists have been employed on these, and it is not too much to say that, although one at least of the designs is crude in its conception and badly executed from a decorative point of view, the rest are well-conceived and well-executed. Commencing at the north-west corner, Mr. F. D. Millet himself leads off with two subjects, one in each of the semi-circular spaces below the dome. One represents Penelope and her weaving machine, while in the other is portrayed the return of Ulysses; these two compositions are good and quiet in tone, and therefore not contrasting too rudely with the surrounding whiteness of the architecture. The draperies are well rendered in light pinks, yellows, and blues, while the figures are handled in a broad, flat manner, which is very suitable.

Continuing round the building, we find that the domes on either side of the north entrance are treated respectively by Mr. T. G. Beckwith and Mr. Walter Shirlaw. These domes have four semi-circular arches cutting into them where the entrances and ambulatories cross one another.

Throughout the building where these occur, artists have placed figures in the spaces formed by the meeting of the semi-circular arches, and often by garlands and angels connecting these. In that by Mr. Beckwith the subject taken is "Electricity," one figure having an electric motor, another working an electric telegraph, while a figure representing Electricity in a flash of lightning is placed at the top of the dome. Mr. Shirlaw, in the next, represents allegorical figures of gold, silver, pearl, and coral rising from the corners on a gold ground. Coming to the north-east corner, the two tympani are representative of pottery and glass-blowing, and are by Mr. L. C. Earle. These, and especially that of

glass-blowing, are perhaps the worst on the building and show no real decorative treatment, being executed in coarse black colours as an easel painting with strong effects of light and shade. The domes over the angle pavilions are in every case very badly handled. They are spherical, like the side ones, with semi-circular arches cutting into the four sides, the two facing the ambulatory being occupied by the paintings, the two outer ones being open. The dome itself is treated with a blue ground, and coarse gold chains of a very ordinary pattern are painted in gold and follow round in horizontal directions, the whole being exceedingly bad and coarse in detail.

These were all executed by a "firm" which perhaps accounts for it. The next two domes are by Mr. G. E. Simmons and Mr. Kenyon Cox, the latter best known as an illustrative black and white artist in the *Century* and other illustrated periodicals. His figures represent textile fabrics, ceramics, metal work, and building, and show four figures appropriately treated with different coloured drapery, the space above being treated as a cloudy sky. It is as satisfactory as any of the domes, while the reverse must be said of the other artist's work.

At the south-east angle Mr. Walter MacEwen, who has studied in Paris, has taken the subject of music. The scheme is thoroughly French, of the best class and harmonises well.

Turning the corner and coming to the centre of the south façade we find the two domes are executed by Mr. T. Alden Weir and Mr. Robert Reid. In the first, four figure on pedestals representing Decorative art, Painting, Goldsmiths' art, and the Art of Pottery are seated at the angles, with a boy-subject between holding a shield. The skin is of a deepish yellow, while the colouring of the drapery is rich while subdued. In the adjoining compartment, Mr. Reid has represented Design, Textiles, Metal, and Ornament, by four figures, draped in light reds, yellows, and greens, with a light mauve sky.

On the south-west angle, Mr. Garo Melchers, who has also studied at Paris, has taken up the "Arts of Peace" and the "Arts of War" in his two spandrels, the subject being treated with good flat washes, the skins of the warriors being of a swarthy hue, the colour of the armour being perhaps slightly overdone, but the execution being very good; perhaps too many figures are in the "Arts of Peace," which has the appearance of being somewhat overcrowded.

On the western side, the northern of the two domes is executed by Mr. E. H. Blashfield, who has taken as his subjects the arts of the Ironworker, the Goldsmith, the Brassworker, and the Armourer; Mr. Blashfield has done more decorative work in the States than any one, as mentioned above, and his reputation certainly will not suffer from what he has done here, which is thoroughly decorative, in a light flat key, while above, on a blue spotted sky, birds are introduced. We have gone somewhat fully into this building, because so many artists have been employed on it, and partly because it seemed to give such a scope for subjects which decorative art could so well interpret.

On the Agricultural Building on the opposite side of the grand basin, Mr. G. W. Maynard has treated the whole of the figures himself, the framework being painted by another hand. In the Manufactures Building the scheme was more or less Renaissance in character, while here Mr. Maynard has gone in for something which is essentially Pompeian in feeling. The paintings occur at the central entrances and at the angle pavilions on the walls under the colonnades. The wall to the main entrance on the north is treated with plain Pompeian red with Greek key pattern in a subdued yellow. On the right is Ceres on terra-cotta ground in a golden chariot drawn by young lions, treated in flat tints; while on the left is King Triptolemus in his chariot given by Ceres in order to go forth to teach the nations of the world the art of agriculture. Between these, on each side of the entrance, are figures representing "Abundance" and "Fertility" in deep red on a light orange ground. The corner entrances are decorated with figures on either sides symbolical of the seasons, and above are friezes in which oxen, horses, &c., occur. All the subjects, it will be seen, are treated from the point of view of their relation to agriculture, and the whole presents a completely thought-out scheme in which the colouring, although harmonious, is perhaps somewhat too bright; but accentuated at so few points on the structure, it certainly errs on the right side.

It will be remembered that the Machinery Hall, besides having an ambulatory on the ground story, also has a loggia to the upper story with a colonnade of Corinthian columns in front. The wall of this loggia has been decorated by Messrs. Maitland, Armstrong, & Co. in pale yellow, and mouldings picked out in gold. Although the general effect of the long vista looks well, it hardly amounts to a colour scheme, so sparingly has it been introduced; the same may also be said as to the Electricity Building, although the semi-circular entrance in the centre of the south front and abutting on the court, which is executed by Mr. Garnsey in a light decorative key, the figures being put in by G. W. Maynard, has a character suitable to the subject.

Mr. Millet, the Director of Colour, took the dome of the Fine Arts Building in hand; in the pendentives he placed four figures illustrative of Architecture, Painting, Sculpture, and Engraving; the drapery being in white, with a pale violet tint running through it. The coffers in the upper part are kept very quiet.

The colour decoration of the Horticultural Buildings consists merely of a frieze round the inside of the dome, consisting of festoons and wreaths of the passion vine; in the wreaths are inscribed the names of men famous in horticulture and kindred sciences, treated in bright and gay colours, and quite suitable for the purpose, although of course not coming in the higher domain of decorative art. Mention must be made of the New York State Building, by Messrs. Mackim, Mead, and White. The design is founded on that of the Villa Medici, at Rome. The colour work in the grand staircase hall was undertaken by Mr. C. C. Colman. It is a space 46 ft. by 37 ft. The main scheme is Pompeian, the background being a very strong red, such as is seen in some German restorations, and which quite kills everything in the way of architectural features which are in the vicinity. The figure-subjects which occur are in small geometrical panels, and are very well put in and show careful drawing and knowledge of the style, and it seems a pity that the general effect has been so spoiled by such a loud background.

The great Hall on the first floor is luxuriously finished in "staff," in the Louis Seize style, the colouring being of cream and gold. In the centre of the ceiling in a deeply-moulded panel is an allegorical subject, by Mr. F. D. Millet, treated in somewhat faded colours, and going well with the light key of the general scheme.

The Transportation Building, by Messrs. Adler & Sullivan, which we have reserved for the last, is by far the most important piece of colour decoration at the Exhibition. The building has been described, and it has been shown how, from the very first, the building was designed for a great colour scheme. Mr. Sullivan has some original ideas on the question of colour, one of these being that on the principle that you cannot have too much of a good thing, that, therefore, you cannot have too much colour.

It has been shown that beyond the great projecting cornice and the Golden Gateway there are no architectural "features" of any kind, the walls being just left with the plain plaster surface. No less than forty tints of colours have been used in the façade, which consists of a series of semi-circular arches, the lower portion occupied by two columns, with Byzantine-like foliage, supporting a beam treated in colour with flat surface. The general scheme of the façade is a series of geometrical figures, simple in the first instance, such as circles, in which other figures are interwoven of different colours, so that the original figure is almost lost, the whole producing an effect akin to embroidery. The main arches are enclosed by a band of dark red, which is the strongest colour in the scheme, and the smaller figures are worked down from this colour, which serves as a base. Above the piers of every other opening is a large figure, 14 ft. high, of a woman holding a screen in front between her hands, with the name of some famous inventor in regard to Transportation. The idea of Mr. Sullivan in these stiff and almost archaic figures was to get the idea of motion expressed without movement of the body, and for this reason the figures, which are all similar, have large outspread wings of white colour, which detaches them somewhat from the main colour scheme. The figures are painted on canvas, and afterwards applied to the façade. Mr. Sullivan, it may be mentioned, is an enthusiastic botanist, and all his system of sculptured and coloured work is derived from a study of practical botany.

The main entrance, 100 ft. wide by 70 ft. high, which is known as the Golden Gateway, and which faces the lagoon, consists of a series of semi-circular arches in receding planes, enriched with carvings and bas-reliefs and sculptured forms. These arches come down on to an angular plinth. The whole gateway is treated with aluminium, covered with yellow lacquer. This was done because it was cheaper than gold-leaf, and the action of the weather has produced a rich, varied tone, which is certainly very effective. The parts below the surface are picked out in subdued blues and reds to accentuate the various geometrical forms.

As a purely colour scheme, thought out and designed from its very commencement for polychromatic decoration, this building is as important, and perhaps more so, as any erected in recent years. Of course such a scheme of colour was impossible in the main court, where the architects wisely determined to leave the surfaces plain white, from motives of symmetry and general effect, but, as the Transportation building is placed away from the main court, and in front of the picturesque wooded island, it could not interfere with the surrounding architecture, and praise is due to Messrs. Adler & Sullivan for the thoroughness with which they have treated the building as a colour problem. It must have required a considerable amount of boldness even for an American architect to have thrown aside the usual architectural forms and accepted methods, and to have designed a building from the very commencement with reference to the application of colour, and not, as is usual in such cases, to apply it as an afterthought. It may be interesting, as showing that the executive spared no money in the realisation of the scheme, that the contract price for the colour work alone was 5,000*l.* sterling, and its real cost must have exceeded that sum.

From what we have said it will be seen that colour decoration has received more attention from architects and decorators at the Columbian Exhibition than any previous one, and, as we have before mentioned, here we have the actual work executed and occupying the place it was designed for, and where it can fairly be judged on its merits, which it is impossible to do with isolated schemes shown in a picture gallery. That an American school of colour decoration will naturally grow out of this seems but the natural result, especially in a country possessing rich citizens, who are not unwilling to expend large sums in the adornment of their houses, their churches, and their public buildings.

NOTES.

THERE seems to be a somewhat widespread desire, both on the part of coal owners and miners, for the resumption of work at the coal mines; and, as some of the former are said to be prepared to re-open their pits at the old rate of wages, it is very improbable that the struggle will last much longer. The Welsh miners appear to have repented already of their outbreak, and will, doubtless, soon resume the employment so hastily and unadvisedly thrown up. The chief event of the week has been the conference of miners in London, the result of which had not transpired at the time of writing. The main point for consideration is, whether those who are willing to work, and who are offered their old places at their old rate of wages, can, in the interests of the Miners' Federation, be allowed to resume. There are arguments both for and against such a course being pursued before the general questions at issue are settled, and the fact that opinion is very much divided, points to an early termination of the struggle. Outside pressure from consumers, and the diversion of orders to pits which have not closed, will naturally go far towards inducing the coal owners to re-open as early as practicable; even though — as in the cases alluded to — it would involve abandoning their original position.

WE have been invited to view the exhibition, which is now being held at the Art Union, of the works of art selected by the prizeholders for the year 1893. The pictures, in most cases, represent the selection of the prizeholders themselves from a recognised exhibition such as the Royal Academy, the Royal Society of British Artists, the Royal Water Colour Society, the Royal Institute of Painters in Water Colours, Nineteenth Century Art Society, the New Gallery, the Royal Hibernian Academy, and the Society of Lady Artists. It may be well to remind readers that "the Art Union was established to promote the knowledge and love of the fine arts and their general advancement in the British Empire by a wide diffusion of the works of native artists, and to elevate art and to encourage its professors by creating an increased demand for their works and an improved taste on the part of the public. It is under the direction of a Council of the members, whose services are honorary." Having inspected the exhibits, in the majority of which we are disappointed, the question may well be asked whether the advancement of knowledge and love of art, as followed in the Art Union, is really under the direction of the Council? Is it not rather under the direction of the prizeholders, who, with or without any knowledge of art, as the case may be, are turned loose into a recognised exhibition by a Council who, we infer, are confident that, in buying from these exhibitions, the prizeholders cannot help obtaining a work which will advance their knowledge and love of art? The best work in the exhibition is undoubtedly landscape, and many, if not most, have been seen before this year in the exhibitions. "The Blackwater from Danbury, Essex," by Thomas Pyne, is a pleasant landscape, with sunny foreground. A "Big Drink," by J. T. Nettleship, from the Academy, occupies considerable space; we should, however, prefer the charms of this picture in a gallery than in a private house. We next come to "Miller's Dale, Derbyshire," by T. Williamson, and "Christchurch, Morning," by D. Longsdon, both good landscapes, and likely to give pleasure to their possessors, though the clouds of the latter lack character and drawing, and the position of the figure in the foreground is capable of alteration. "Summer Time, Riverdale, Dorking," is a capable piece of colour by Chas. Collins, and has near it "Fish Girls Waiting for the Boats," by H. Caffieri, "Gossiping," by Geo. Marks, and "Rye, from Winchelsea Marshes," by W. H. J. Boot. All are pleasing landscapes, but the figures in the last-named are hurriedly and badly put in, and spoil the foreground. "Across the Marsh to Rye," by W. T. Bishop, is the only other landscape that we recollect with much pleasure. Lord Westbury has lent his picture, "The Silver Dart," by John Clayton Adams. (An etching of this is to be supplied to the members of the Union.) It is a charming piece of colour, and the most interesting of the exhibits.

HABITUÉS of the famous sale rooms of Messrs. Christie, Manson, & Woods when they resort to them next season will find a considerable change in their outward appearance. The common-place front and the insignificant entrance, which were a good fit after all to the wonderful works of art to to be found within, are in process of disappearance, to be followed in due course by a more striking frontage. It will not be without regret that many will view the change, for something unique in its way, and rather characteristic of our English ways, will have disappeared when the dingy old front of this celebrated mart is replaced by a more modern and more pretentious building. That the firm itself would have been glad to have retained the old and well-known appearance of the outside of these rooms is, we understand, not in doubt, but the inexorable decree of the landlord, in this case the Crown, left no choice but to replace the old front by one more in keeping with the new style of buildings in the West-end of London.

THE decision of the Court of Appeal in the case of Lister *v.* Lane, which is reported in the current number of the Law Reports, cannot be considered as stating any new principle of law. But it emphasises one which has been frequently acted on, and applies it to a particular set of circumstances. The plaintiff claimed against the defendant damages for breach of a covenant "to repair, uphold, support, sustain, and maintain" certain premises. The building was a riverside house at Lambeth, a wall of which bulged out; it was an old house which had existed for over a century, and the foundations of which were piles in the mud. It was proved by the evidence that in order to place the house in good and safe condition a new concrete foundation must have been built. The Court of Appeal held that under these circumstances the tenant was not liable, because a covenant to repair and maintain a house must be construed with regard to the age and general condition of the house at the commencement of the tenancy. As Lord Justice Kay truly remarked, "the house was built upon a timber structure laid on mud, the solid gravel being seventeen feet below the timber structure, and the only way in which it could be repaired was by underpinning the house. Would that be repairing, or upholding, or maintaining the house? It would not, it would be making an entirely new and different house." No doubt it would be very agreeable to a landlord to have a new concrete foundation instead of a rotten wooden structure, but the aim of the law is not to give a landlord new material in place of old, but to oblige a tenant to keep old material in as reasonably good condition as is possible under the circumstances.

AMONGST recent additions to the Guildhall Art Gallery are two pictures, the gift of Sir Reginald Hanson, of Old Westminster Bridge, 1747, from the river, by Samuel Scott. In one of these views Scott shows a long gable roof next west of and in line with that of Westminster Hall, and the tower of St. Margaret's Church, as surmounted by a leaden truncated pyramid instead of the stone cupola delineated in his similar painting in the National Gallery (bought out of the Wheeler fund, and formerly in Lord Lonsdale's collection sold by auction in 1887), and the latter cupola does not correspond with the smaller cupola, or rather lantern, which the tower carries at this day. One of the two pictures —it has been engraved by P. C. Canot—is labelled as "looking down the river"— apparently by mistake, for (as in the other) the church tower and Cardinal Morton's Gatehouse, Lambeth, are shown in the background, to the left hand. We notice also Abraham Pether's view, from Chelsea [Battersea] Bridge, of the burning of Drury-lane Theatre, on the night of February 24, 1809; the picture was presented by Colonel Rutley; Mr. Philip Norman's painting of the Holborn front of Staple Inn, done before the recent restoration by Mr. Alfred Waterhouse, architect, wherein the seventh gable (westwards) does not appear (see "Notes" in the *Builder* of November 13, 1886, and November 12, 1887); and Mr. E. A. Heffer's drawings of portions of the choir, Westminster Abbey, showing Henry V.'s. tomb and chantry, and monuments of Henry III., Edward I., and Eleanor of Castile, and, in St. John the Baptist's chapel, that of Thomas Ruthell, Bishop of Durham, secretary to the Kings Henry VII. and VIII., who by mistake sent to his later master an inventory of his own private possessions instead of a State paper. The chapel is now entered by the beautiful little doorway of St. Erasmus's Chapel.

THE Public Gardens Association have offered to lay out, subject to its maintenance by the Islington Vestry, the newly-turfed plot of ground which was lately obtained by covering over a further portion of the New River. The length lies along Canonbury-villas and Astey's-row, between Canonbury-grove and the "Old Thatched House" tavern, which claims to have been established in 1400, where the river passes beneath Essex-road, and so to re-appear, but now no longer open to the sky, at the north end of Colebrooke-row. Thus the parishioners will be recompensed, in a measure, for their loss of the once pleasant spaces in and about Canonbury-fields. The Association have also arranged with Lord Calthorpe for the preservation as an open space of the area in front of Duncan-terrace, at the southern end of Colebrooke-row, which he had proposed to sell as a building site; whilst the Vestry have relinquished their opposition to a similar sale of the three-sided area at the junction of the Goswell and City roads, formerly known as Jack Plachett's-field. At Paddington Mr. Joseph Guedalla's committee have finished their labours, extending over three years, and resulting, we read, in the collection from public and private sources of 57,322*l.* So in the course of next month a public recreation-ground of about twenty-three acres will be handed over to Paddington Vestry, in trust for the public. A notable feature here is the children's outdoor gymnasium, which is greatly enjoyed; and an Act of Parliament, obtained *ad hoc*, enables the trustees to encourage the use of the ground for games and exercises. We learn, too, that efforts are being made to secure, with the co-operation of the Hampstead local authority, the yet remaining nine acres of St. Mary's-fields, by Kilburn.

WE have received Dr. Horne's report to the Local Government Board on diphtheria at Derry Hill, in the Calne and Chippenham Rural Sanitary Districts, in which, however, there seems to be no direct connexion established between the illness and any special insanitary condition of the habitations; at least the report sums up somewhat to that effect. It is stated that the Marquis of Lansdowne, who is lord of the manor and a principal landowner, has for some time steadily pursued a policy of replacing dilapidated dwellings by more modern constructions as opportunities have

offered, and that, generally speaking, the interiors of the cottages exhibit a commendable clean and tidy appearance. In our opinion, the details set down in the report as to drainage and water supply ought to be quite sufficient to render the neighbourhood a too favourable camping ground for diphtheria. We read that—

"Privies, with pits of various dimensions sunk below the surface, abound. They are frequently placed in outhouses, such as sheds used also as stables or stores, or are situated in gardens. Many are in bad repair. One, a tumble-down affair, consisted of a few uneven timbers stood on end, a dilapidated thatched roof, and a foul pit. The ash-pits vary in size, but are simply holes dug in the ground, into which house refuse is cast, and wherein, as I have said, bedroom slops are often emptied. Two or three were veritable 'sumpt' holes, with dirty water standing around the sodden contents. . . . . Water-supply is obtained from wells averaging, perhaps, 20 ft. in depth. They are usually lined with loose stonework, uncemented, down to the water level, and are not seldom in proximity to dwelling, privy, or ashpit. Thus, in the instance of a couple of semi-detached cottages, in which there have been four fatal cases of diphtheria during the last eight years, and in which the stone floors are some 3 ft. below the level of the garden behind, the well, though about 5 yards from and on a higher level than the dwellings, is situated only some 8 yards below a privy which accommodates twelve persons, while immediately to the rear of this privy there are two pigsties and two ashpits. The privy vault is emptied once or twice a year, and I was told the contents are then found nearly dry."

Surely it is not suprising, after this, to read that "diphtheria appears to have been prevalent, more or less, in and about Derry Hill for some years."

DR. R. BRUCE LOW'S Report to the Local Government Board on an outbreak of enteric fever in certain villages situated on the river Rye in North Yorkshire, is of some special importance, as showing the evil effects of water-drinking from an open river. It appears that there are a few wells, of very bad construction and in very unhealthy surroundings, but disease has not been directly traced to these; while it was acertained that in every household invaded by fever the water used for domestic purposes was taken from the river Rye. It is therefore of importance to note through what surroundings the Rye passes. We extract the following from the further portion of the report:—

"The feeders of the Rye rise in the Cleveland Hills, and the river proper is formed by the junction of two main streams, about five miles above Helmsley. The Rye thus formed flows in a deep, well-wooded valley, part of its course being through the extensive parks of the Earl of Feversham. From these it emerges at Helmsley, where the river receives a tributary called the 'Boro' Beck.' The Rye then flows along the south side of the Vale of Pickering to Nunnington, having for about five or six miles elevated ground rising almost immediately from its south bank. Further on, the Rye passes through flat country, and finally empties itself into the River Derwent, about four miles from the town of Malton. During the course of the Rye from its source till it reaches Nunnington, it receives the drainage from a number of hamlets and scattered farm-houses along its banks, as well as from certain villages, such as Fangdale-beck, Hawnby, and Rievaulx. Lastly, it receives the sewage of the town of Helmsley, as well as the drainage of cultivated land through which it flows below Helmsley.

Specific contamination of the Rye above Nunnington by excreta from enteric fever cases may have arisen through pollution of the river derived from several separate sources; and three such sources deserve special consideration—

1. From the sewage of Helmsley, which is discharged into the river in a crude state five miles or so above Nunnington.
2. From "town manure" and night-soil from Leeds, spread upon fields near the river between Helmsley and Nunnington.
3. From privy "muck" spread by the Nunnington people, upon fields, gardens, and allotments on either side of the Rye, above the point at which they draw their drinking water.

1. The town of Helmsley . . . . stands at the point where the Boro' Beck joins the Rye. . . . The town in two-thirds of its extent is sewered to two outfalls; one direct into the Boro' Beck, and the other into a tank on the banks of the Rye below the town, the overflow from this tank passing direct into the river. The remaining third part of Helmsley, which is unsewered, comprises the High-street, with Church-street and Castlegate; practically one wide, straight street, down the middle of which flows the Boro' Beck. At the top of the High-street stands the workhouse. The Boro' Beck at three different parts of its course down the street, is covered over, viz. (1) just opposite and below the workhouse for a distance of 80 yards; (2) just above and opposite the church, for a distance of 141 yards; (3) at the bottom of the street to the junction of the Beck with the Rye, a distance of 120 yards. Into these archways or tunnels, the drains of houses in the High-street discharge. At the workhouse there are five water-closets, which discharge into the first tunnel; into the second tunnel several water-closets, one of them from a hotel, discharge; and into the third tunnel several other closets, as well as one outfall from sewers in other parts of the town, discharge. The pipes conveying sewage into these dark archways do not usually reach the water in the stream, but discharge, in many cases, on the sides of the archways. The bed of the Beck is irregular, covered with stones, and the water channel is liable to be changed by floods. These tunnels are high enough to allow boys to walk through them; and they are used by idle and mischievous persons, for disposing of broken crockery, discarded pots and pans, broken baskets, disused dishcloths, worn-out matting, and other rubbish. To these in times of drought the filth and garbage cling. . . . Four schoolboys living in different parts of the town, in a spirit of bravado, dared each other to explore the dark recesses of the first archway of the Boro' Beck. All four boys did penetrate its filthy recesses, and in about a fortnight or three weeks all four boys developed enteric fever."

This is certainly a very instructive commentary on the views of those who would support the system of water-pumping from open rivers as a natural and economical source of water-supply.

WE learn that Dr. Povah, rector of St. Olave's, Hart-street, is engaged upon a history of his own and All Hallows, Staining, churches. The former, once called St. Olave's-by-the-Tower, was built *circa* 1410, and escaped from the Great Fire. It is often mentioned by Pepys, who used to attend service there when living in Seething-lane—whither he removed, into the Navy Office, from Axe-yard, Westminster, in July, 1660—and in Hart-street. Here he, his brother, and wife were buried. On March 18, 1884, the late J. Russell Lowell, being then American Minister, unveiled a memorial to Pepys, placed against the south wall, near the old doorway between an outer staircase and the Navy Office gallery pew. The memorial consists of a bust and alabaster tablet executed by Messrs. Earp, Son, & Hobbs, of Lambeth, and designed by Sir Arthur Blomfield, architect. The staircase is drawn in West and Toms's view of 1736. The battlements shown in their view were replaced with a plain parapet during some repairs made in 1822-3 by J. B. Gardiner, architect, who rebuilt the east (pointed) window of Bath stone and removed the Doric front (1674) of the north door. In 1632-3 the nave roof had been rebuilt of new timber and new leaded. Sir Arthur Blomfield made some interior alterations in 1871; the extensive repairs of 1892 were carried out under Mr. Ewan Christian's superintendence. Sir George Gilbert Scott designed the reredos, a gift, we believe, from the present rector, and the Caen-stone font. The organ, by Green (1781), was much improved in 1860, and again, by Walker, in 1871. The pulpit, from St. Benet Gracechurch, is the reputed work of Gibbons. Stow records twenty-six monuments and inscriptions in this interesting church; we may also cite those of Pepys's wife, Elizabeth (1669); Sir Andrew Riccard. *ob.* 1672, who gave the advowson in trust to the parish, and to whom the Turkey Company set up a statue; Sir John Radcliffe (1568), son of Robert, Earl of Sussex, and his wife Anne; Robert and Richard Cely, early benefactors; Sir John Mennes (1670), Comptroller of the Navy, joint author of "Musarum Deliciæ"; Dean Turner of Wells (1568) and his son, Dr. Peter Turner (1614). Maitland mentions a brass of one John (? Arundell), Clarenceux, dated 1427. In his "Churches of London," the late George Godwin writes:—

"There are vaults beneath the church, and we were informed by the present intelligent Clerk of the parish, Mr. Samuel Smith, that the foundation-walls are of rubble work, consisting of pieces of unhewn stone and chalk, cemented together with mortar."

In 1870 they pulled down All Hallows, Staining, in Mark-lane, excepting the tower,* and the parish was united to St. Olave's. West and Toms published an engraving of the church, which Stow tells us was so called "for a difference from other churches of that name in this city, which of old time were built of timber, and since were built of stone." The churchwardens' books, which began with the year 1492 (some extracts from them are published in Vol. III. of the *British Magazine*) record John Mun's gift of 100*l.* for enlarging this church (1615). Having escaped the Fire, nearly all but the tower suddenly fell down in 1671; the body of the church was rebuilt in 1674-5, after a plain design. The story goes that the Princess Elizabeth stopped to worship here on her way to Woodstock, after her release from the Tower on May 19, 1554, and then went to dine at the "King's Head," in Fenchurch-street.

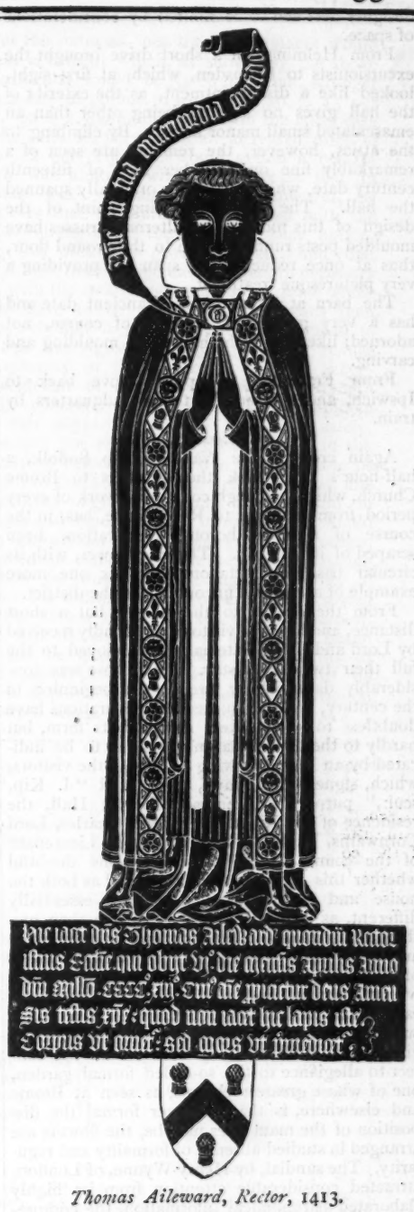
THE current number of our American contemporary *Stone* contains an interesting article on the "Bluestone quarries of New York and Pennsylvania." We may remark that bluestone is the name given to one of the varieties of sandstone, which consists of exceedingly small particles of silica cemented together by silica; a small proportion of argillaceous matter is usually present. The stone is extremely hard and durable, but is difficult to work. Our contemporary states that the quarrying of bluestone probably requires as much skill, if not more, than any other kind of rock. The peculiar formation of the material, and the fact of its usually occurring in comparatively small deposits, make the use of machinery impracticable, so that at least 90 per cent. is quarried by hand-wedges and sledge-hammers. Quarries within four or five hundred yards of each other frequently differ greatly as to quality and size of blocks obtainable. The beds are usually thin on the top, and thicker as the deposit is worked into. The stone is well adapted for street paving, flagging, and curbing, and we learn from the *Mineral Statistics of the United States*, that the three States which produce it—New Jersey, New York, and Pennsylvania—annually furnish about five millions of cubic feet, valued at a million and a half dollars. We have no stone in Great Britain precisely similar in character to this.

MANY of our readers will regret to see the record in our obituary column of this week of the sudden and unexpected death of Mr. Louis J. Dessurne, who has been for a good many years the sub-editor of this journal, and its representative as reporter at many meetings of architects, archæologists, and sanitary engineers. Mr. Dessurne, who has been for eighteen years connected with this journal, was in the first instance engaged merely as a reporter, but his varied abilities and considerable practical knowledge of many technical matters connected with building soon led to his occupying a more responsible post on our staff, though to the last he acted as principal reporter at certain of the more important meetings of architects and others,—the meetings of the Institute of Architects, the Architectural Association, and those of the Association of Municipal and Sanitary Engineers. As a reporter Mr. Dessurne possessed that rare and invaluable quality, a kind of instinct in laying hold of the essential points in the argument of a speech or lecture, and passing over the non-essentials, even when in cases where the subject itself was strange to him; and in this respect we believe it may be said that he was one of the ablest reporters of lectures on technical subjects to be found in London; while he was one of the most careful and painstaking of sub-editors in securing accuracy in the ultimate form of printed matter.

* A model of the tower was made by Mr. Birch for his "Old London," Health Exhibition, 1884.

Hic iacent Willis fitz William dñs de Sproteburgh armiger et Elisabeth
uxor eius filia Thome Shalworth militis qui quidem Willus obiit apud
Harhillay primo die mensis decembr. A° dñi millimo CCCC° lxx° quarto et
predicta Elisabeth die mensis anno dñi millimo CCCC°

William Fitzwilliam, Esq., and Elizabeth, his wife.
Sprotboro, Yorkshire, 1474.


Hic iacet dñs Thomas Aileward quondñ Rector
istius Ecclie qui obiit vj° die mensis Aprilis anno
dñi millo CCCC° xiij° Cui aie propicietur deus Amen
Sis tibi xpe: quod non iacet hic lapis ute.
Corpus vt amet: sed mos vt precetur.

Thomas Aileward, Rector, 1413.
Havant, Hampshire.

From rubbings made by F. R. Fairbank, M.D., F.S.A., 1892.

Apart from sub-editing work, Mr. Dessurne's special *forte* was sanitary appliances, of which he had a very extensive knowledge, and a very notable memory for what had been done in the way of successive inventions in the past history of sanitation. We think these few words of acknowledgment are only what is due from us to the memory of a man of whom it may be said that he did his work well and conscientiously—which is one of the best things any of us can desire to have said of us after we are gone.

BRASS OF WILLIAM FITZWILLIAM, ESQ., AND ELIZABETH HIS WIFE, SPROTBORO', YORKSHIRE.

THIS brass, which is probably of local origin, lies in the chancel of the church of Sprotboro', which was the burial-place at one time of the Fitzwilliam family. The will of Mr. Fitzwilliam here commemorated is preserved at York. In it he expresses a wish "to be buried in the choir of the church of Sproteburgh, so that no impediment may be occasioned in going and returning to those ministering about the Divine services in the choir aforesaid." This would imply that already inconvenience was felt to be occasioned by the more pretentious altar-tomb, and points to the convenience of memorials such as these. The testator bequeaths 40s. to the belfry to be made *de novo*. The lower part of the tower is of Decorated date, with curvilinear tracery in the windows. The upper part—belfry—appears to be of the date of this testator.

F. R. F.

THE BRASS OF THOS. AILEWARD, RECTOR, HAVANT, HAMPSHIRE.

THIS fine brass of a priest in processional vestments lies in the choir of Havant Church, with the feet to the west. Its position was doubtless originally in the choir, with, probably, the feet towards the east. When Haines wrote, it was placed against the wall in the north transept.

F. R. F.

THE ARCHITECTURAL ASSOCIATION:

TWENTY-FOURTH ANNUAL EXCURSION.*

Wednesday, August 16.

ON this day the visitors commenced their work on the Suffolk side of the Waveney, taking the train to Ipswich, where they were met by carriages. Driving through the town, a halt was made at the famous house in the Butter Market, erected by Robert Sparrowe in 1567, and illustrated in the *Builder* last week. Tradition says that Charles II., after his retreat from the battle of Worcester, was for some time concealed in this house, and the descendants of Robert Sparrowe long possessed a miniature portrait of the King, said to have been given to his host on quitting his hospitable asylum, but this presumptive evidence notwithstanding, it is very doubtful whether Charles was in the county of Suffolk at all after the decisive battle of Worcester. Sparrowe's house remains, however, the finest example of ancient domestic architecture in Ipswich, not only by reason of its well-known façades to the street, but for its internal finishings in woodwork and plaster, its charming little internal court and its private chapel in the roof.

A long drive in the broiling sun brought the party to Helmingham Hall, one of the seats of the ancient family of Tollemache, whose representative, Tolmac, was a great man before the Conquest. By the kindness of Lord Tollemache, the members were shown through the ground floor of the house, and were able to admire the furniture and fittings, pictures and prints, but sketching being forbidden inside, their attention was soon diverted to the exterior, which, although it is somewhat overlaid with comparatively modern work, is highly picturesque in its red brick and stone and tile, weathered and relieved by the moat which surrounds the whole. Being a large house, the buildings extend nearly to the moat, a narrow walk all round being left between the water and the walls of the house, which thus occupies with its large internal courtyard, practically the whole of the space enclosed by the moat, just as at Oxburgh Hall, visited on the King's Lynn excursion. Smaller houses seen on this excursion have, in this part of the country, their moats also, but the moat encloses far more than merely the house.

The church at Helmingham is a very pleasing example of the usual type, with a curious dormer window on the south side inserted to give room for a lofty monument, the aspirations of whose

* Concluded from p. 138, *ante*.

designer declined to be limited by considerations of space.

From Helmingham a short drive brought the excursionists to Framsden, which, at first sight, looked like a disappointment, as the exterior of the hall gives no sign of being other than an emasculated small manor house. By climbing to the attics, however, the remains are seen of a remarkably fine open timber roof of fifteenth century date, which must have originally spanned the hall. The most interesting point of the design of this roof is that alternate trusses have moulded posts running down to the ground floor, thus at once reducing the span and providing a very picturesque treatment.

The barn at Framsden is of ancient date and has a very good roof, though, of course, not adorned, like that of the hall, with moulding and carving.

From Framsden the party drove back to Ipswich, and returned to their headquarters by train.

Thursday.

Again crossing the Waveney into Suffolk, a half-hour's drive took the members to Brome Church, which, although containing work of every period from Norman to Renaissance, has, in the course of a very thorough restoration, been scraped of its interest. The west tower, with its circular base and octagon belfry, is one more example of a type not uncommon in the district.

From the church to the hall is but a short distance, and here the visitors were kindly received by Lord and Lady Bateman, and enjoyed to the full their two hours' stay. The house was considerably damaged by fire at the beginning of the century, and the subsequent reparations have doubtless to some extent modified its form, but hardly to the extent that might seem to be indicated by an old engraving shown to the visitors, which, signed "L. Knyff, del.," and "I. Kip, scul.," purports to represent Brome Hall, the residence of the Right Honourable Charles, Lord Cornwallis, Baron of Eye, and Lord Lieutenant of the county of Suffolk. It seems doubtful whether this is more than a design, as both the house and the gardens are shown essentially different, as well as far more grandiose than any thing that remains. The gardens, as they exist, are as good an example as could well be found of the "formal garden" of the eighteenth century, with clipped box and yew, straight and geometrical borders and alleys, which, seen on a bright sunny morning, took by storm the hearts of the visitors, and converted any waverers on the subject to allegiance to the so-called formal garden, one of whose greatest charms, as seen at Brome and elsewhere, is that, however formal the disposition of the main lines may be, the flowers are arranged in studied absence of formality and regularity. The sundial, by Henry Wynne, of London, attracted considerable attention from its highly elaborated astronomical information, the comprehension of which baffled the powers of the visitors as of their hosts. The house, as it stands towards the gardens, with a great octagon on the west side, its two stone bays on the south, its crow steps and cut brick chimneys, seems to fit the garden as this does to fit the house, and produces a most charming and delightful home, from which all were loth to part.

On an A.A. excursion, time and the quartermaster are inexorable, and so progress was made for Wingfield, passing on the way, near Hoxne, the spot where tradition says that St. Edmund, king and martyr, was beheaded, as well as the bridge which he is said to have made his last hiding-place after the Castles at Dunwich and Framlingham had failed him, as a protection against the Danes. The somewhat flippant remark has been made that had the Saint's Christianity been of a more muscular character he might have been more of a king and less of a martyr.

Wingfield Castle was built by Michael de la Pole, first Earl of Suffolk, in the reign of Richard II., but of his work, the south front and moat are practically all that remain. The west side, now converted into a farm-house, is of sufficiently early date to be picturesque, though there is little detail left. As a piece of colour, Wingfield Castle is about the most charming tit-bit seen during the week, which for the water-colour sketchers of the party was one continuous revel. Two hours, therefore, seemed all too short, when two days or two weeks could have been filled by the painters. The west side attracted the most part of the sketchers, but east, north, and south all had good subjects, whilst several artists favoured the internal courtyard, for Wingfield was of sufficient size to possess this feature already remarked at Helmingham.

The church of St. Andrew was visited by some of the members and is highly interesting, being a collegiate church, the house for a provost and nine priests, having been founded by Sir John Wingfield in 1362. The choir stalls still remain, with their original plan maintained. The vestry or sacristy has a room over, with two hagioscopes through the wall, and another commanded the altar from the sacristy. It is evident, therefore, that the property of the church was of some value. The vestry has a piscina of ancient date in its origin a position. The rood-screen has completely vanished, but it evidently extended right across nave and aisles, as the two stone staircases, one in the north aisle and one in the south, still remain, and a fragment of the rood beam has been left. The church appears to have been some time in reaching its present form after the foundation of the college in 1362, as much of the work, and notably the chancel, with its highly ornate arcade on the south side, is clearly of later date, and reaching well into the fifteenth century. A curious chest exists in the vestry or sacristy hewn out of a solid tree, like a "dug-out" canoe. There are some remarkably fine tombs and brasses of the Wingfields and de la Poles, including that of the founder, and there are also some interesting fragments of old glass.

Friday.

The first visit on this day being fixed for Framlingham, a long drive from Diss of some two-and-a-half hours was first necessary. In spite of the excessive heat—for this is said to have been the hottest day of the century—the drive was very enjoyable, and everyone was in good spirits. Framlingham is not only a picturesque town, with considerable architectural attractions, but possesses a certain amount of historical interest as the scene of the exploits of Boadicea, Queen of the Iceni. At what time the original castle was built is uncertain, but it is known that a fortress existed here in the time of Redwald, third King of the East Angles. The castle was also the retreat of King Edmund the Martyr, as already alluded to. In 1173 it became the temporary asylum of Prince Henry, whom Queen Eleanor, his mother, had incited to rebel against his father, Henry II. Upon the death of Edward VI., in 1553, Mary retired to this castle, where she was joined by the inhabitants of Suffolk and the neighbouring counties, who, to the number of 13,000, accompanied her to London to take possession of the crown. The outer walls of the castle, as well as the moat, are in a tolerably perfect state, but there is little detail of an architectural character remaining beyond some very good cut brick chimneys, and the gateway tower with the arms of the Howards, Mowbrays, and Brothertons in one shield, having lions for supporters, and for the crest a lion passant. The church is a large and stately edifice, principally of Perpendicular date, with a lofty square western tower, over the entrance to which is a representation of St. Michael encountering the dragon, sculptured in high relief. The nave has a very fine roof, with fan groining in oak to the lower portion, and collar beam above. There is also a fairly well preserved fresco of the Crucifixion on the wall over the north arcade, and a good brass pendant candelabrum. The chancel is, however, the finest part of the church, and is said to have been added in the reign of Edward VI.; but is now disused, the chancel arch and side arches to aisles being blocked up. An old organ front received much attention from the sketchers, as did also the remarkably fine tombs of early Renaissance date. The monuments of Henry Howard, Earl of Surrey; Henry Fitzroy, Duke of Richmond, natural son of Henry VIII.; the two wives of Thomas, Duke of Norfolk, who was beheaded in the reign of Elizabeth, and the wife of Sir Robert Hitcham, are the principal examples. The almshouses of the town were visited, but did not call forth the sketch-books, as, in spite of their antiquity, they lack architectural interest.

After luncheon, on the return journey, a halt was made at the church of St. Mary, at Earls Soham, a comparatively small but interesting building. The nave is said to have been erected about 1470, and the chancel about 1320 A.D. The hammer-beam roof with its sculptured figures in niches to the wall-posts is the chief attraction, and other good woodwork of seventeenth-century date may be seen in the pulpit, with its tester head, and the west gallery. A piscina at the south end of the aisleless nave is a somewhat unusual feature. The south porch, with its figure of St. James, is picturesque, although not elaborate. Efforts were made by some of the party to decipher some inscriptions on the buttresses of the western tower, which are believed to record the names of the designer and builder of the church, but their weather-worn state prevented their recognition in the short time at the disposal of the visitors.

Southolt, included in the programme, was omitted for want of time, and the next stoppage was made at Fleming's Hall, another example of the picturesque moated manor-houses in which the district is rich. The date on the sun-dial, which was made by one Henry Sutton in 1659, is probably very close to that of the house, which has picturesque curved gables and mullioned and transomed windows, all executed in moulded red brick and originally stuccoed to represent stone. In the interior of the house are some fragments in various rooms of oak panelling which bear evidence of greater importance than the house now possesses. Refreshed by the host with apples and cider, the visitors proceeded on their way in good spirits.

This completed the day's work according to the programme, but as the way homeward lay through Eye, a halt was made to enable the members to look at the magnificent church of St. Peter and St. Paul, the tower of which is one of the finest in the Eastern Counties. The screen, with its double planes of tracery, and its colour decoration, gesso work, and paintings attracted considerable attention. There is in the chancel a very ancient tomb, much defaced.

The remains of the castle were looked at only from a distance, as they are now of small importance, little being left of the work of Robert Malet, whose father accompanied William I. to England. Robert Malet also founded at Eye a Benedictine monastery dedicated to St. Peter, to which was annexed the ancient episcopal see at Dunwich, and in which was preserved St. Felix's book of the Gospels, written in large Lombardic characters, and called the Red Book, on which the people used to be sworn, and which was removed from the abbey at Dunwich when that place was destroyed by the sea.

Returning to Diss, the evening was celebrated by the final dinner and music, prior to the departure next morning of the members, Diss itself not containing more architectural attractions than its church, some of the features of interest in which we illustrated last week, and a few fragments of old timber houses.

On Saturday, some of the members, under the guidance of Mr. Searles-Wood, the honorary secretary of the Excursion, again visited Ipswich, where they inspected some of the old houses of the town, and then went to Christchurch, so named from the priory of Augustine canons, originally founded in 1177, and, being destroyed by fire, re-founded soon after by John, Bishop of Norwich, for a prior and six canons. Part of the grounds of the ancient monastery now form a public park.

PORTLAND CEMENT: THE VALUE OF FINE GRINDING.*

In this short paper it is proposed to deal entirely with the above point in the use and manufacture of Portland Cement.

In June, 1890, the author had the honour of reading a paper before this Association at their District Meeting at Norwich, on "Portland Cement Specifications," in which paper the subject of grinding was touched upon as follows:†

"The second clause generally found in the specification is with respect to the degree of fineness to which the cement is to be ground. This, of course, is a practical test, and one of great importance; the finer the cement is ground the greater its value for concrete work. I may mention that the average requirement is not more than 10 per cent. to 15 per cent. residue when sifted through a 50² sieve, that is, one having 2,500 holes to the square inch. Such residue, however, although the hardest and best part of the burnt 'clinker,' is of no more value in the cement than so much sand, but which, if ground, would greatly increase the strength and the commercial value of the cement."

Since that time a number of papers on Portland cement have been read and discussed before different Associations, in most of which the advantages of using finely-ground cement have been demonstrated, but as far as the author is

* Being a paper read by Mr. H. K. G. Bamber, F.C.S., at a recent meeting of the Association of Municipal and County Engineers, West Bromwich.

† "Proceedings of the Incorporated Association of Municipal and County Engineers," vol. xvii., page 158.

aware it has not yet been shown what is the actual gain in strength to be obtained by this finely-ground cement compared to the increased price per ton which is to be paid for the more finely-manufactured article. The author has often been met with the reply when discussing the subject with an engineer, "What is the use of having finely-ground cement if we have to pay so much more for it"? It is this point with which the author proposes to deal, and to endeavour to show from the results of experiments which he has made with cement ground to different degrees of fineness, what is the increased gain in strength, and what would be the cost to the manufacturer of reducing cement to this extra state of fineness, when engineers will be able to decide for themselves whether it is more economical to use a finely-ground cement or a comparatively coarse one.

For the experiments on this subject the author used a cement having the following composition:—

Silica	24·600
Alumina and oxide of iron... ...	10·761
Lime	61·664
Magnesia	1·010
Sulphuric acid	1·424
Carbonic acid	·210
Organic matter, &c., and loss ...	·331
	100,000

And having a specific gravity, fourteen days after being ground, of 3·181, and ground to leave a residue of 15 per cent. on a 2,500 mesh sieve, which is about the degree of fineness a buyer of cement generally obtains, unless he specifies a more finely-ground cement, and pays for it in proportion.

In order that the results of these experiments might be comparative, a sufficient quantity of this sample of cement was placed in an air-tight case, and small portions taken therefrom for the experiments as required, which extended over several days, so that the condition of the cement for the last series of experiments was practically the same as for the first, the cement having been kept free from exposure to the air.

Experiments were first made with this neat cement to show the tensile strain obtained at seven and fourteen days respectively after being gauged, the briquettes having been kept six and thirteen days respectively in water. The original cement was first taken, having a residue of 15 per cent. on a 2,500 mesh sieve, and the following experiments, with the same cement, with the residues on the different size sieves, as shown in the first column, ground to pass through the same:—

Fineness of Cement.	Quantity of Water.	Tensile Strain at 7 days.	Tensile Strain at 14 days.
	Per cent.	Lb.	Lb.
15 per cent. residue on 2,500 (50×50 mesh)	18	440	530
Leaving no residue on 2,500 (50×50 mesh)	18·5	467	561
Leaving no residue on 4,900 (70×70 mesh)	19·5	480	580
Leaving no residue on 8,100 (90×90 mesh)	20	500	595
Leaving no residue on 12,100 (110×110 mesh)	21	510	620

The results given are an average of six briquettes in each case, and the strain was applied at the rate of 100 lbs. every fifteen seconds, the increase of strength being gradual with each degree of fineness. It will be seen also that the quantity of water used for gauging, to obtain the same state of consistency before placing in the moulds, increased with each degree of fineness, showing that there was more cementitious material therein ready to take up its equivalent of water.

The increase in value of cement, however, due to fineness of grinding, is much more clearly shown by sand tests than by neat tests, each small particle of sand requiring to be covered over by a thin coating of cement, and it was evident that the more finely ground it was the greater would be the surface on the particles of sand which would be thus covered. It will be noticed, however, that in the cement used for these experiments, the residues on each sieve have been ground up to pass through the same and then added to the original, which had already passed through, and it will be readily understood that if the residues on each particular sieve had been ground up, as would be the case in practical work, without separation from that part of the cement which was already fine enough to pass through, even that finer part would have been still further reduced, and a cement of much finer average would be produced than that with which these experiments were made, and should consequently show even better results than those given below with the residues ground separately, and afterwards added.

The sand used for these experiments was the standard sand obtained from Leighton Buzzard, of a size such that all should pass through a 20 × 20 mesh sieve, and be retained on a 30 × 30 mesh sieve. The results were obtained at twenty-eight days, the briquettes having been placed in water twenty-four hours after being gauged, and are the average of the six highest strains obtained in each case, the strain being applied, as before, at the rate of a 100 lbs. every fifteen seconds.

Fineness of Cement.	Parts by Weight of Sand.	Parts by Weight of Cement.	Quantity of Water.	Breaking Strain in lbs. per sq. in.	Average.	Increase of Strength.
15 per cent. residue on 2,500° (50 × 50 mesh)	3	1	p.c. 10	145, 160, 148, 160, 160, 150	154	Original.
Leaving no residue on 4,900° (70×70 mesh)	3	1	10	180, 190, 185, 185, 115, 190	186	p.c. 20·7
Leaving 10 per cent. residue on 5,776° (76×76 mesh), and no residue on 50 × 50 mesh	3	1	10	195, 210, 255, 210, 200, 200	212	37·66
Leaving no residue on 8,100 (90 × 90 mesh)	3	1	10	240, 250, 230, 235, 230	237	53·89
Leaving no residue on 12,100° (110 × 110 mesh)	3	1	10	290, 295, 300, 295, 286, 298	294	.. 90·90

From the results of these experiments it will be seen that the increase of strength, using the same cement simply ground to a finer state, is gradual with each degree of fineness, amounting, when the cement is ground fine enough to all pass through a sieve having 12,100 meshes to the square inch, to more than 90 per cent. of the original, and even this might be still further increased, as shown by Mr. A. E. Carey, M.Inst.C.E., in a paper read before the Institution of Civil Engineers in 1892,* where he has given the results of an experiment made with three parts sand and one part of cement, from which the residue on a sieve of 32,257 mesh had been removed, and with which he obtained a tensile strain of 360 lb. per square inch at twenty-eight days.

From actual trials which the author has made he has found that with suitable machinery for the purpose, the increased cost to the manufacturer of grinding a well-burnt cement to a state of fineness so that all should pass through a 50 × 50 mesh sieve, and leaving only 10 per cent. residue on a 76 × 76 mesh sieve, compared to what the author calls ordinary grinding—viz., 10 to 15 per cent. residue on 2,500, would be about 30 per cent., and to grind the cement so that all should pass through a sieve of 12,100 mesh would be about 100 per cent.; but it must be remembered that this increased cost of manufacture only applies to the expense of grinding the cement, and not to the whole value of the cement per ton, which in the first case would be met by an increase of price of about 2s. per ton, and in the latter of about 6s. per ton.

* Minutes of Proceedings, Inst.C.E. vol. cvii., p. 47.

For this extra 2s. per ton the engineer would obtain a cement which, as shown by the above experiments, would be 37·66 per cent. stronger than a cement ground to leave from 10 to 15 per cent. on a 2,500-mesh sieve, or in the latter case for the extra 6s. per ton, or an increased price of about 22 per cent., he would obtain a cement which was almost twice as strong as that in ordinary use. It may be said, however, by engineers that they are quite satisfied with the present strength of the concrete they obtain, using this ordinarily ground cement, and that they do not think an increase of strength necessary even with the small augmentation of price which would have to be conceded. The point then arises, whether it would be more economical to use this finely-ground cement, and to reduce the quantity in the concrete, but still keeping sufficient to maintain the average strength of the concrete. The author is of opinion that this might be carried out with safety, but would not recommend the reduction of the quantity of cement in concrete which was to be exposed to the action of sea-water, however fine the cement might be ground, as the gain in strength and impermeability in such work would alone more than compensate for the increased outlay on the cement. With the object of finding out how far this reduction in the quantity of cement for ordinary concrete might be carried out, the author has made the following experiments with the same cement as previously, but in this case he gradually reduces the quantity of cement used in the concrete blocks until he reaches a point when only one-half the original quantity is taken.

Fineness of Cement.	Parts by Weight of Sand.	Parts by Weight of Cement.	Breaking Strain in lbs. per sq. inch.	Average.	Increase of Strength over Original.
15 per cent. residue on 2,500 (50×50 mesh)	3	1	145, 160, 148, 160, 160, 150	154	Original.
Leaving no residue on 12,100 (110×110 mesh)	3	1	290, 295, 300, 295, 286, 298	294	p.c. .. 90·90
Leaving no residue on 12,100 (110×110 mesh)	3	0·830	260, 265, 246, 240, 250, 248	251	p.c. 63·0
Leaving no residue on 12,100 (110×110 mesh)	3	0·750	180, 195, 190, 195, 195, 195	192	p.c. 24·6
Leaving no residue on 12,100 (110×110 mesh)	3	0·620	160, 180, 175, 180, 178	175	p.c. 13·6
Leaving no residue on 12,100 (110×110 mesh)	3	0·500	160, 170, 172, 167, 165, 162	166	p.c. 7·79

It will be seen by the results obtained, that by using cement which has been ground fine enough so that it shall all pass through a 12,100 mesh sieve, the increased strength of which, as shown by the previous set of experiments, over the original cement is more than 90 per cent., that the quantity of cement may be reduced even to the extent of one half, and even then the original strength of the concrete is more than maintained.

The author also made similar experiments with the same cement ground to leave only 10 per cent. on 5,766 mesh sieve, which is a degree of fineness now being frequently asked for by engineers, and it will be seen from the following results that even in this case the quantity of cement used in the concrete may be reduced as much as 25 per cent. without any reduction in the strength of the same.

Fineness of Cement.	Parts by Weight of Sand.	Parts by Weight of Cement.	Breaking Strain in lbs. per sq. inch.	Average.	Increase of Strength over Original.
15 per cent. residue on 2,500 (50×50 mesh)	3	1	154 160 148 160 160 150	154	Original.
Leaving 10 per cent. residue on 5,776 (76×76 mesh)	3	1	195 210 255 210 200 200	212	p.c. 37·66
Leaving 10 per cent. residue on 5,776 (76×76 mesh)	3	0·750	156 150 150 165 162 165	158	p.c. 1·3
Leaving 10 per cent. residue on 5,776 (76×76 mesh)	3	0·500	137 140 132 160 162 140	145	Less than Original.

The author is of opinion that the results of all these experiments clearly show that these coarse particles of unground cement clinker, which are retained even on a sieve of 12,100 mesh to the square inch, are of no cementitious value whatever, and, as previously stated, are of no more use in the cement than so much sand, and he has found by experiment by taking the original cement, separating the residue on a 12,100 mesh sieve, which amounted to 40 per cent., replacing this quantity by an equal amount of sand of the same size as the residue, that the tensile strength by this alteration has not been materially, if any, reduced.

The question also arises whether these coarse particles are not a source of danger to the concrete, especially when it is in contact with sea-water. It is generally admitted now that for concrete to resist the action of sea-water and to be permanent must be made so as to be absolutely impervious to sea-water. The careful engineer who has such work to construct uses every precaution, as regards his materials and quantities of water used, to obtain this impermeable concrete structure, but he probably forgets that these coarse particles of unground cement "clinker," amounting perhaps to 40 per cent. of the whole quantity of cement being used, will absorb water with avidity but will not combine with it, but will pass it on to other pieces of this coarse cement or other absorptive material that may be in contact with it, and thus in the course of time enable the sea-water to find its way into the very heart of the concrete, when destruction would probably commence. That such may be the case is borne out by some experiments on the filtration of sea-water through concrete, published as an Appendix in a paper read before the Institute of Civil Engineers* by Mr. W. Smith, M.Inst.C.E., in which it is shown that the percolation through concrete made with coarsely-ground cement is much more rapid than when made with finely-ground cement.

While on the point of impermeability of concrete, the author would like to refer to an experiment which he made for a paper read by his father, Mr. H. K. Bamber, F.I.C., &c., before the Institute of Civil Engineers in 1892. The author was once asked by an engineer who had been laying down some concrete footpaths, how it was that after a shower of rain some of the slabs, which had all been made with the same cement, seemed to absorb the water and remain wet for a long time after, while other adjacent slabs quickly became dry.

The experiment was made with an idea to discover the proper quantity of water which cement would take up when mixed as concrete, and which was found to be about 40 lbs. or 4 gallons to each cubic foot of cement used.†

"In making these experimental blocks, 5,184 cubic inches of shingle, 2,592 cubic inches of sharp sand, and 1,296 cubic inches of cement, measured separately, were mixed with 30 lbs. of water, and put into a box 18 in. cube, completely filling it without any residue. Exactly the same quantities of shingle, sand, and cement were then mixed with 15 lbs. of water, with the result that a box of the same dimensions could only hold seven-eighths of the mixture. This shows that when mixed with insufficient water the concrete occupies one-eighth more space than when mixed with the full quantity of water it can take up. Therefore there were air-spaces in the latter block equal to one-eighth of its bulk more than in the first block, which when placed under water would allow water to percolate into and through it."

This, the author thinks, will explain the cause of the dry and wet slabs in the footpath. In mixing concrete for paving, small quantities were gauged at one time to enable each slab to be placed in position and completed before setting commenced, and as the water used is not always measured, it is probable that the absorptive slabs were mixed with less water than their dry-looking brethren, and when a shower came the water passed through them and, of course, would take longer to evaporate than if only just wetted on the surface.

* "Minutes of Proceedings, Inst. C.E.," vol. cvii., pp. 94 and 95.

† "Minutes of Proceedings, Inst. C.E.," vol. cvii., p. 37.

Illustrations.

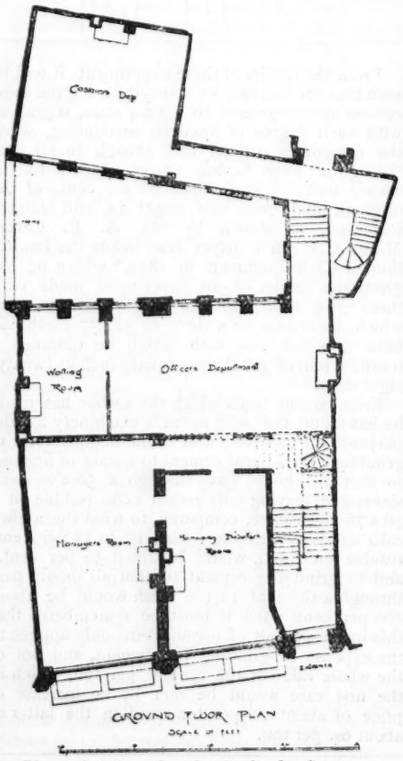
ACCEPTED DESIGN FOR THE NEW OPÉRA COMIQUE, PARIS.

WE give reproductions of the perspective view and two of the plans of M. Bernier's design for the new house for the Opéra Comique at Paris, which has received the first premium in the recent competition, and which we presume will be carried out.

We gave some remarks on the design and on the antecedents of its architect in a short article on the exhibited designs in the *Builder* for July 29, 1893. Our readers will probably agree with the remark we then made, that the design seemed to have been selected for its plan rather than for its architectural beauty, the design being indeed a commonplace one enough, and not such as we should have expected Paris to have been content with for a building of so much public interest, and from which so much was expected. The design is a respectable one, suited to its purpose, but much more than that can hardly be said. It will be of interest to our readers, however, as a representation of the selected design in an architectural competition which has excited so much interest in Paris.

OFFICES FOR THE P. & O. STEAM NAVIGATION COMPANY, LIMITED.

THESE buildings, situated in Leadenhall-street, are faced on the exterior with Portland stone, with bands of Corsehill stone. The columns of the top story are also composed of Corsehill stone. The building is fireproof throughout, and will be lighted by the electric light. The sculpture in spandrels above the arches of the main windows is by Pegram, and the square panels below the same windows are to have paintings representing the progress of the P. & O. Company in regard to ships, the paintings being by Mr. Frank Murray. The general contractors are Messrs. Mowlem & Co., and the architect is Mr. T. E. Collcutt.



Plan of Offices for the P. & O. Company, Leadenhall-street.

DESIGN FOR WALL-DECORATION: "PSYCHE."

THIS is a monochrome reproduction of a sketch for a nearly life-size figure in natural colour on a blue ground, the central part of the panel being darker than the border, upon which the running pattern is painted in a paler greenish-blue.

The figure is draped in white, with a salmon-coloured cloak, and a white veil with a purple border. It is designed for a wall in full light, the surface to be finished dead, and is to be painted upon canvas, and affixed to the wall in the French fashion, and then retouched *in situ*—a mode of procedure from which excellent results may be obtained. The artist is Mr. F. Hamilton Jackson.

ARCHITECTURAL ASSOCIATION EXCURSION: SKETCHES.

WE give here the second set of sketches in connexion with the Architectural Association's annual excursion, of which a descriptive notice will be found in another column.

THE SANITARY INSPECTORS' ASSOCIATION:

CONFERENCE IN GLASGOW.

THE proceedings in connexion with the annual conference of the Sanitary Inspectors' Association, the members of which visited Glasgow last week on the invitation of the Glasgow Police Commissioners, were commenced on the 17th inst. in the Corporation Galleries, Sauchiehall-street. About 100 of the sanitary inspectors of Great Britain were present. Mr. Crawford, convener of the Health Committee, presided, and welcomed the members to Glasgow.

The President's Address.

In the absence of Sir Benjamin Richardson, the President of the Association, Mr. Nicol, City Chamberlain, by request of the writer, then read the Presidential address. In the course of his remarks he reviewed the past history of sanitation, and spoke of the work that lay before them in the continuance of their sanitary labours, with special reference to sanitary inspection. Dealing with the past, he pointed out the great advancement that had been made during the preceding forty years. He referred to the remarkable and important revolution which had taken place in the theory and practice of the medical art. The tendency of medicine, which a century ago was directed toward the division of diseases into many hundred forms and the formation of the most elaborate and complex nosologies, was being reversed, and the whole meaning of modern medical inquiry went to prove that disease was a unity with a variety of phenomena, and that the causes of disease were reducible to a few elementary forms. . . . A new Pharmacopœia had come into sight, which all could read. Its principles were preventive, its objects wide, and its elements some seven only, and these, the world's great property, were no more, no less, than pure air, proper nourishment, a regulated temperature, bodily exercise, cleanliness, mental education, and good morals. Thus in some of the most important sections of the community there was a general improvement and simplification of knowledge on those great and vital questions, upon the correct solution of which so much of the world's happiness and progress rested. He referred to the advantages which had resulted from the labours of the medical officers of health and the sanitary inspectors, and stated that by different steps of progress sanitation had now become the leading subject of the day. . . . Intended reforms, to be safe, must be gradual, must be founded on actual knowledge, and must be understood in the order they were set forth. The elements of the sanitary question were few in number, but they lay deeper than was generally supposed, and many notable health measures, too temporary in their character, were scarcely

calculated to affect the great questions at issue. There was a strong feeling abroad that legislative enactments were the most capable of doing service in the preservation of health and in the suppression of disease. He would not deny that the decision in a law court might check or remove some real cause of disease, but he doubted altogether the correctness of extreme principles of coercion or compulsion — he doubted the general competency of the men upon whom devolved the duty of inflicting fines and penalties on those adjudged guilty of breaking laws of health. It seemed to him that, if a man understood natural laws of health he was not likely to break them, and he was sure that no man could be a judge who did not understand those natural laws; therefore a judge must be a sanitarian specially selected, which was not a probable, he had almost said not a possible, selection. The labours of the true sanitary reformer lay in four directions — namely (1) In an endeavour to understand simply the nature of diseases, their alliances, their true distinctive characters, the modifications to which the body was subjected under the influences of diseased action, and the chemical or physical measures best adapted for removal and prevention of disease; (2) In an endeavour to seek out primarily the causes of diseases, irrespective of the symptoms and the other details involved in the consideration of the diseases themselves; (3) In striving to make the vast stores of information already acquired in regard to the two forms of inquiry above noted accessible to all classes of society, by having them scientifically popularised and diligently taught, especially amongst the child population; and (4) In giving free scope and encouragement to those mechanical arts which tend to improve the beauty and convenience of towns and cities, to lessen muscular labour, to increase the comforts of the poor man's home, and to institute such an elevated class of amusements and occupations for leisure moments as should make the heart more happy and the mind less animal. In these offerings to reason and knowledge lay the one and true *elixir vitæ*, the beginning and the end of sanitary science. Principles ignored, all else was practically mere dilettantism — mere playing with details of principles, the principles themselves being undeveloped—a common error. Right honourable and honourable gentlemen might debate in the Senate House, might sit on committees of inquiry, publish tons weight of blue books, and invest magistrates with new powers, but the mortality tables of the Registrars-General would continue to tell how little could be done until a new educational impulse was given to the people leading to personal health, to health of the whole community springing from health in the unit of that community. . . . . In short, in relation to sanitary science, legislation could do but one thing—namely, promote scientific sanitary education; and if it could do this, it could speedily do all that could be done. Their task as sanitary reformers for the future lay in the art of diffusing knowledge into every nature, however dense, capricious, obstinate, sullen, or indifferent; and for this task the office of sanitary inspector was particularly valuable, quite apart from its direct intention.

The Mayor of Maidstone moved a vote of thanks to Sir Benjamin Richardson for his address.

Councillor Paton seconded, and the motion was cordially confirmed.

The Tenure of Land.

Mr. Hugh Alexander, London, Chairman of the Council of the Association, next read a paper on "The Tenure of Land—A Sanitary Question." The nation as a whole was, he remarked, responsible, and not individuals or sections of the community, for the continuance of a system of land tenure which was at once an outrage upon common sense and the dictates of equity, and which, he submitted, was the primary cause of the insanitary conditions which prevail throughout the length and breadth of the kingdom. The ownership of the land was a sanitary question of the very first importance, and its adjustment in the public interest, either by nationalisation of the whole land of the country as a permanent settlement, or by municipalisation of town lands in the first instance as a preliminary, demanded the highest exercise of patriotic statesmanship for its fulfilment. Fortunately in this country the greatest revolutions could be effected constitutionally, and with due regard to all interests affected thereby; and so it would, no doubt, be when the great impending revolution in the tenure of land took place. But if it appeared to anyone that private interests would be in danger, then he would remind him that the law as it stood sanctioned the acquirement by Local Authorities of both land and dwellings in areas shown to be in an insanitary condition and prejudicial to the public health, and that had been largely done in Glasgow, in the metropolis, and in other centres of population; and every man's interest in properties dealt with in such areas had been purchased or had received proper compensation, and it might fairly be assumed that an extension of that principle, so far as the ownership of the land was concerned, to the whole area of towns and cities would be found quite practicable, and should within a given time be made compulsory upon Local Authorities, coupled with power to acquire adjacent lands needed for town expansion at just valuations. If that were accomplished leaseholders and other renters would at once become the tenants of, and pay rent to, the Local Authorities; for which purposes the existing rate-collecting machinery would be immediately available for collection of rents and other details. Some of the immediate and very obvious results of the ownership of town lands being thus assumed by public bodies would be that improvements in ground values would benefit the whole community, and the vexed question of rating ground values would settle itself. Building leases might still be granted, but perhaps on more equitable terms than at present; and with power given to Local Authorities to purchase adjacent lands for town expansions at fair valuations there would be no necessity nor incentive to crowd houses on area.

The Rev. Robert Dickson moved a vote of thanks to Mr. Alexander.

Mr. P. Fyfe, in seconding the motion, pointed out that it must not be forgotten that the people themselves were to a very large extent to blame for their insanitary conditions. In Glasgow he could make very powerful comparisons between houses on the same landing; at the same time there were some houses so situated that it was impossible to put the inhabitants in a proper sanitary condition.

The motion was then adopted.

The first day's sitting was brought to a close with a vote of thanks to the Chairman, on the motion of Mr. A. Hay.

The members were afterwards entertained to luncheon by the Corporation, and subsequently they drove in open carriages from the Corporation Galleries and visited the Kelvinhaugh Refuse and Despatch Works, Belvidere Hospital, Clyde-street (Calton) Model Lodging-House, and Greenhead Baths and Wash-houses.

The Conference was resumed on the 18th inst., Bailie Ure Primrose, Glasgow, was Chairman for the day, and in opening the proceedings he briefly reviewed the progress that has been made in practical sanitary work in Glasgow during the last thirty-five years. In Berlin and other Continental cities they were striving to-day with many problems that were faced in Glasgow thirty years ago. Among the chief works undertaken in the city he mentioned the water supply scheme, which, he said, at once cut down the death-rate perceptibly; the hospitals for infectious diseases, the City Improvements scheme, the Buildings Regulation Act, and the works now under construction for dealing with the sewage of a part of the city. In reference to the last-mentioned, he said he believed that before long they would go for a complete scheme, not for Glasgow alone, but they would take means to have the whole valley of the Clyde created a Conservancy Board, so that their beautiful river might be restored to that condition of purity in which bountiful nature gave them it.

Councillor James Dick, Chairman of the Hospitals Committee of Glasgow Town Council, spoke of that department of sanitary work coming under his notice in his official position. He held that they ought to have a Notification Act compulsory over the whole country; that they ought to have infectious disease hospitals for each local authority by itself, or combining as best suited them, and that these ought to be compulsorily obliged to provide infectious disease hospitals; and finally, that, with properly guarded provisions, there should be the power compulsorily to remove patients infected with infectious diseases to these hospitals, so that the community might not suffer.

The Sanitary Inspector and his Vocation.

Mr. Peter Fyfe, Chief Inspector of Glasgow, next read a paper on "The Sanitary Inspector and his Vocation." The day in the history of the world, he said, to which might be credited the birth of the first sanitary inspector was unknown. But undoubtedly the man in this kingdom who did most in evolving the inspector and his duties from a hygienic chaos was the late Sir Edwin Chadwick. Scotland in 1888 lost 17,670 persons from preventible disease. The reduction of this "slaughter" was the *raison d'être* of the vocation of the sanitary inspector. That vocation was to keep the country clean, and a vaster problem was not set before any body of men. An ever-increasing net-work of sanitary law had been and was being spread around our increasing populations with a view of keeping premature disease and death at a minimum; but the irreducible minimum was yet far from being reached, and there were still certain individuals and bodies of men who desired to retard the process. The position of medical officers and sanitary inspectors, he proceeded to show, was greatly elevated by the passing of the Local Government (Scotland) Act of 1890, by which the tenure of their positions was secured against the *laissez faire* local authority. The result given during the short time since the Act came into operation had been marvellous. Plain spoken and fearless reports had been issued by both sets of officers, regardless of local or any other interest but that of the great body of the people. These served as the index finger to the pathways by which the central authority of the future was to advance. In England the sanitary inspector was not in so good a position. It was not to be desired that men whose duty it was day by day to enforce the Sanitary Acts against big and little should, even if overshadowed by the ægis of a quasi-State protection, do otherwise than walk warily. But by leaving them without appeal to the effects of organised sinister interests, as they could be expressed through the action of vestries or local boards, was to encourage the degeneracy of the official, and tended to convert his tact and courtesy into neglect and weak concession. The value of the sanitary inspector's vocation to the public had been immensely enhanced since the passing of the local government measure, and it lay with England to give her people and her inspectors similar benefits. The external equipment of the sanitary inspector was a legal power to inform three parties at three different periods that there existed a condition of things at a particular place dangerous or injurious to the health of the people; but he complained that the summary removal of nuisance was hopeless in the present state of the law. A want in the external equipment of the sanitary inspectors in many parts of the country was efficient assistance. Many chief inspectors were obliged to fritter away their time in running from one case of infectious disease to another, doing work which could be done equally well by a trained subordinate. In conclusion, Mr. Fyfe adverted to the necessity of provision being made for the training and equipment of sanitary inspectors. At present there were no proper technical or other colleges where young men might learn not only the principles, but the practice of sanitation. He trusted that by their united representations at headquarters they might be able to induce Government to issue a grant to all technical colleges and schools, in order that good teachers, with adequate appliances at hand, might be able to impart the technical knowledge and learning so urgently required. Not until this, or something equivalent to this, had been done would the public, or the local sanitary authorities who represented them, be secured in a proper choice from among candidates for the posts which fell vacant.

Improvements in Sanitary Law.

Mr. W. Wilkinson, chief sanitary inspector of Derby, next read a paper on "Needed Improvements in Sanitary Law." The Scotch representatives, who were always awake to safeguard the interests of Scotland in the Imperial Parliament, had, he said, secured for their officers in the Act of 1867 the designation of "sanitary inspectors." They had also set an excellent example in creating sanitary inspectorships, and giving permanent tenure of office to sanitary inspectors, both of which provisions he hoped to see extended to the rest of the kingdom. He spoke of the work done by the sanitary officers, remarking that they were now more than mere scavengers, and he urged that it was desirable that they should have a thorough education in the methods of construction, lighting, ventilation, water supply, drainage, and in all classes of building. Having alluded to the supineness of many of the sanitary authorities in discharging their duties, and pointed out that it was open to them to fill the position of sanitary inspector, irrespective of the fitness of candidates, he urged the desirability of having one examination only, to be held by the Government, as a test of theory, after the candidate had had a

thorough practical training. It was generally supposed that the inspector was empowered by the law to take at once all needful steps for the removal of anything offensive or injurious. This was not the case. They frequently came across instances where a nuisance should not exist hours, much less days or weeks, yet they were powerless to insist on a remedy until they had the sanction of the Local Authority to take legal steps. He further contended that the salaries paid to many of the sanitary officers in England were utterly inadequate, quoting instances, and argued that as the authorities had frequently no idea of their powers and responsibilities, the only chance of securing sanitary administration was to enact a minimum salary for the sanitary inspector, to require him to give his whole time to his work, and freedom to do his duty. In concluding, he moved the following resolution :—

Resolved that, in view of the disabilities under which sanitary inspectors discharge their duties, this meeting is of opinion that the interest of the public health within the United Kingdom would be largely promoted by the enactment of the following amendments in sanitary law :—

(1) That all officers now variously named sanitary inspectors and inspectors of nuisances be designated sanitary inspectors.

(2) That every accepted candidate for the position of sanitary inspector within the United Kingdom shall possess a certificate of competency in sanitary law and practice, such certificate to be granted only by examiners appointed by Government.

(3) That the sanitary inspectors of England shall be elected to permanent tenure of office, and shall only be dismissible for misconduct or proved incompetence, with right to appeal to the Local Government Board, as it is now provided for Scottish inspectors under the Local Government (Scotland) Act, 1889.

(4) That in reference to the Public Health Acts of England it shall be the duty of sanitary inspectors to inspect the districts to which they are appointed, to receive complaints of nuisances and serve notices forthwith requiring all necessary works to be done for the abatement of nuisances, such notices to be as valid, if confirmed by the Local Authority, as if served by the Authority's order.

(5) That sanitary inspectors shall be required to give their whole time to the duties laid upon them by their Local Authority, and that an adequate minimum salary be prescribed.

(6) That the Superannuation Allowances Act, 1866, 29 Vic., cap. 31, which applies to the metropolis only, be extended to include the officers of all urban and rural sanitary authorities within the United Kingdom, and that the said Act be amended, giving thereby to all officers a legal claim to superannuation.

Mr. Thomas George Dee, Westminster, London, seconded the motion; and after remarks by Messrs. West, Walthamstow; Jennings, Rotherham; Lindsay, Mid-Lothian; and Gerrard, Liverpool, it was unanimously adopted.

On the motion of Councillor Langlands, votes of thanks were passed to Mr. Fyfe and Mr. Wilkinson for their papers.

The members then adjourned to the adjoining hall, where luncheon was served.

The Land Laws.

On the conference resuming—Councillor Crawford in the chair—Mr. Alexander, in terms of notice, proposed :—

"That this meeting is of opinion that the land laws of the United Kingdom as at present in force stand in the way and obstruct the moral and physical redemption of the people, and are the primary cause of the insanitary conditions with which the nation is afflicted."

The motion was duly seconded, but a number of members took exception to the subject being brought forward, and ultimately Mr. Alexander withdrew his motion.

On the motion of Mr. Fyfe, a vote of thanks was passed to Mr. Crawford for the way in which he had conducted the business of the conference, and the proceedings were brought to a close.

In the evening the members of the Association were entertained to dinner in the Banqueting Hall of the Municipal Buildings by the Lord Provost, Magistrates, and Town Council.

Public Improvements, Halifax. — On the 16th inst. Colonel Hasted, of the Royal Engineers, held inquiries at the Halifax Townhall on behalf of the Local Government Board, relative to the Corporation's application for sanction to borrow 30,000*l.* for purposes of electric lighting, and 21,393*l.* for sewage and street improvements (including the diversion of the Hebble Brook). In relation to the proposed electric plant, Mr. Wilmshurst, the electrical engineer to the Corporation, explained that the intention was to lay down plant at the gasworks sufficient to give 10,000 lights within the Borough, but mains of a capacity of 30,000 would be laid beneath footpaths. It was not intended to light the streets in this way.

THE CAMBRIAN ARCHÆOLOGICAL ASSOCIATION AT OSWESTRY.

The forty-seventh annual meeting of this Association was held at Oswestry on Monday, August 21, and four following days. Oswestry, although not actually within the borders of "Gallant Little Wales," is sufficiently near to be in the once debatable territory known as the Marches, and, therefore, the Association cannot be considered as having gone outside its own peculiar province in visiting this district. The "Wynnstay Arms," which was chosen as the headquarters of the Association, is opposite the church of St. Oswald. The association of the place with the name of the saintly king of Northumbria recalls the fact that Oswestry shares with another locality near Winwick, in Lancashire, the honour of being the site of the battle of Maserfield, in A.D. 642, in which Penda, the pagan ruler of Mercia, was victorious over the Christian Oswald.

The country round Oswestry is well wooded, but in other respects comparatively tame. To the antiquary its situation is interesting as lying between the great earthen ramparts known as Watt's Dyke and Offa's Dyke, which run nearly parallel to each other right away from here to the coast of Flintshire.

The proceedings of the Association opened on Monday evening with the address of the President, Mr. Stanley Leighton, M.P., F.S.A. It is a great merit in a President, on an occasion of this kind, that he should not only be a person of influence in the neighbourhood, but that he should be an accomplished archæologist as well, and Mr. Stanley Leighton combines both qualifications. The President, in his address, omitted all reference to the battle between Penda and Oswald, and thus avoided touching on a difficult question. He lamented the removal of Welsh antiquities and historical MSS. to the Record Office and to the British Museum, and pointed out that much of their value was lost when they were thus dealt with. Mr. Henry Taylor, F.S.A., of Chester, suggested that the county councils should be made the guardians of ancient monuments and MSS., and should be empowered to spend money on printing documents of local interest. Amongst other speakers were Mr. Milman, Director of the Society of Antiquaries, the Venerable Archdeacon Thomas, F.S.A., and the Mayor of Oswestry, Mr. A. Wynne Corrie. The latter gave some facts with regard to the rise and progress of archæological societies, not the least remarkable being, that the first institution of the kind was founded in Ireland in B.C. 590.

The principal object of the excursion on Tuesday, August 22, was to visit Chirk Castle, which lies seven miles north of Oswestry. The first stop made on the way was at the large British earthwork called in English Old Oswestry, and in Welsh "Hên Ddinas," about a mile out of the town. Another name for the fortress is "Caer Ogynfan," but on the question of whether Ogynfan was a mythical hero of the Arthurian type or not those present were unable to throw any light. Unfortunately, just before the party reached Old Oswestry the rain began to fall in torrents, notwithstanding which the venerable Archdeacon Thomas conducted a small band of enthusiasts through the entrance in the ramparts into the interior of the fortified area, and there discoursed on the military enterprise of the people who had erected this gigantic work. The hill on which Old Oswestry is situated is 540 ft. above sea level, and some 200 ft. above the surrounding country. The earthwork consists of three ramparts of great height, enclosing an almost level platform of roughly oval shape on the top of the hill. The area within is a lawn of greensward, but the ramparts are all planted with trees, which considerably detract from the imposing appearance of so large a structure when seen from below. Watt's Dyke joins the ramparts on the west side.

The only other stop made between this and Chirk Castle was at Weston Hall (three and a-half miles north of Oswestry), a good specimen of the half-timbered domestic architecture of the district, with an ancient carved oak staircase and small hall with open timber roof in the interior.

A mile and a-half north of Weston Hall the road dips down into the deep valley of the river Ceiriog, which here forms the boundary between Shropshire and Denbighshire, and crosses it by a small bridge at the bottom of the steep descent. Looking down the valley to the eastward, two great high-level viaducts are seen, one behind the other, which serve to carry the Shrewsbury and Chester Railway and the Ellesmere Canal across the pine-clad ravine. The latter, which is the lower of the two, is one of the engineering triumphs of Telford.

By eleven o'clock Chirk Castle was reached, in a thunderstorm, and the members were not sorry to take shelter under the hospitable roof of Mr. R. Myddelton Biddulph until the weather cleared up. A couple of hours soon passed in examining the castle and the art treasures it contains. The castle is built round a rectangular courtyard, and the chief feature which gives a special character to the exterior are the drum towers of unusually large size at the angles. As in some of the French châteaux, mullioned windows of the Renaissance period have been inserted in the round towers of more ancient date, to adapt them to the living requirements of the subsequent occupiers. The entrance is on the north side, and the first room entered is the billiard-room, on the ground floor, which contains a collection of ancient armour. From this access is gained to the second story by a square well staircase in one of the drum towers. The principal rooms are on the north and east sides of the quadrangle on the second floor. They are of magnificent proportions, and beautifully decorated by Crace. The restoration of the building was undertaken by the elder Pugin. The windows are all mullioned, and with broad seats in the thickness of the wall on the inside. One of the most valuable treasures in the Castle is a splendid ebony cabinet, ornamented with silver *repoussée* work, and the doors painted on the inside, said to have been the gift of King Charles II. to Sir Thomas Myddelton. The chapel at the south-east angle contains a fine eagle-lectern. The oldest part of the Castle is the drum-tower at the south-west angle, with a gloomy dungeon in the basement. This is thirteenth-century work, as indicated by the Pointed doorway and lancet windows.

In the garden were seen a beautiful slab with a floriated cross and inscription in Lombardic capitals, and a font used as a flower-pot. Surely these might with advantage be placed within the chapel out of harm's way. One of the pictures at the top of the staircase leading to the principal rooms has a curious story connected with it. The scene represented is the great waterfall of the district, called Pistyll Rhaiadr, but although many miles inland the sea and ships are introduced in the background. The painting is by a French artist, and the explanation of the marine accessories is that when the artist was at work a Welsh shepherd, looking over his shoulder, observed, "You should paint some ships (meaning sheep) about," and sure enough he did, taking the advice in a somewhat different sense from which it was intended.

After admiring the extensive and charming view from the terrace of the castle, the members rejoined their carriages and returned through the park to Chirk, having an opportunity on the way of admiring the beautiful demesne, with its deer browsing amongst the bracken fern, and the unique wrought-iron entrance gates.

The remainder of the day turned out fine. After luncheon at the Hand Hotel, at Chirk, the church of no particular interest, except for some traces of Norman work on the south side, and a mound—possibly a Saxon mote—were inspected. From Chirk the party proceeded through Gobowen to Whittington Castle, three miles north-east of Oswestry. Here there is a mediæval castle built on the site of a Mercian stronghold of the Saxon period. The remains are not extensive, but the fine trees behind, and the duck-pond between it and the road, make it worthy of an artist's attention.

The day's proceedings terminated with a visit to Park Hall, the residence of Mr. A. Wynne Corrie, the Mayor of Oswestry, and Chairman of the Local Committee, where the members were hospitably entertained to afternoon tea in a tent on the lawn. Park Hall is well known as one of the best examples of a half-timbered house in Shropshire.

At the evening meeting a paper was read by Mr. J. Parry Jones on "The Story of Oswestry Castle," and the Corporation charters and plate were exhibited.

We will continue our report of the meeting next week.

Messrs. Adams & Co., Sanitary Specialists, of London, &c., have this month opened larger premises at 107, St. Vincent-street, Glasgow, where most of their patents may be seen in action.

Reredos, Uphill Church, Somersetshire.—On the 13th inst. the dedication took place of a reredos in Uphill Church. The reredos, which is of oak, is of Gothic design, and was carved by Mr. John Northcott, of Ashwater, Devon. The paintings are by Meyer & Co., and consist of five panels.

Correspondence.

To the Editor of THE BUILDER.

SIPHONS.

SIR,—Is there any formula or table for calculating the least quantity of water necessary to pass over the weir of siphons of various sizes, in order that the siphon shall begin to act? I believe that the larger the siphon the larger in proportion is the necessary quantity. The sizes about which I want particular information are 1½ in., 2½ in., 3 in., and 4 in. drain. B. D.

CHIMNEY DESIGNS.

SIR,—We are now erecting a circular brick chimney about 250 ft. high, 20 ft. diameter at bottom, and 9 ft. 6 in. diameter at top. Being in a comparatively level region almost destitute of chimneys, and thus forming a very prominent object in an extensive landscape, it will be an eye-sore over the whole district if it has the ugly head which surmounts so many of our English chimneys. We have made many fruitless efforts to get a design of a handsome head, and would be glad if any of your readers could point us to any published work which gives a selection of chimney-head designs.

MANUFACTURERS.

*** It is most creditable to "Manufacturers" that they should wish to make their chimney an ornament instead of an eyesore to the district. There are architects who could help them to that if they were fortunate enough to find the right people. As they ask for a book, the only one we can tell them of that is worth anything is an American collection of designs reviewed in our columns in the *Builder* of June 10, 1893, and published by the *Engineering Record* (New York) under the title "Water Tower and Pumping Power Station Designs." This was a book of sketch designs for chimneys, not for heads only, but it may afford some hints.—ED.

The Student's Column.

GEOLOGY.—IX.

ORIGIN AND STRUCTURE OF AQUEOUS ROCKS.

IN a former article we gave some account of the origin of aqueous rocks in general, which was sufficient for the purpose then in hand; but they demand greater attention. It is not enough to speak of aqueous rocks generically, we must specify the principal kinds in some detail. The importance of this group will at once be understood when we state that not only do nearly all the building stones fall thereunder, but the choice of sites for houses, reservoirs, railways, canals, and embankments, also many questions relating to water-supply, drainage, and sanitation, in a large measure hinge on our knowledge of the structure and disposition of the aqueous rocks. It is admitted by all geologists that the most rapid method of obtaining elementary knowledge concerning them is to learn something of their mode of origin, though in the more advanced stages of the subject their structure must be first considered.

The origin of the different kinds of aqueous rocks is best arrived at by studying the deposition of sediment, &c., now taking place in the sea adjacent to the shore, in rivers and lakes. We take it for granted that by this time the student understands, in a general way, that the land is being ceaselessly worn away by what are termed the "agents of denudation" (which will be described in a future article), and that the material so detached from the surface of the country, and elsewhere, is carried away by the sea, or rivers, and finally finds a resting place by being dropped or "deposited."

The following diagram (fig. 1) will serve to explain what becomes of the material derived from the gradual destruction by denudation of a sea-cliff made of rocks, which yield to the action of the weather with tolerable ease. It will be perceived that the rocks composing the cliff are continued under the sea, and at one time formed the sea-floor. The portion under water enjoys comparative immunity from destruction, but the denuding agents are ever at work on the exposed parts above the sea-level. They cause the cliff to crumble away, and the beach, consequently, is continually strewn with fallen blocks and fragments, masses of earth, and the like. This detritus the sea eagerly devours in its attempts to clear the beach; the finer particles of earth are transported with facility by the water, but the larger fragments and blocks are much more refractory. The untiring energy of the waves, however, soon reduces even them to such a moderate size that they may be moved, and these in their turn are then made smaller by being continually rolled up and down between tide-marks. These rolled stones or pebbles are employed by the sea in a dual capacity. During storms they are used as ammunition, being caught up by the mighty rollers and hurled with great force against larger blocks, or the solid sea-cliff, when they break up the latter and become themselves shattered, or further reduced in size. The knocking of stones against each other, caused by the continual rolling, slightly chips them and minute fragments of sand are thus provided which may ultimately be taken away by the waves from the beach.

The transporting power of the sea is, of course, controlled by the velocity of the water and the weight of the material to be carried or rolled along. When the velocity of the water, being gradually diminished in receding from the shore, becomes insufficient to keep the particles in suspension, they drop by their own weight, and are deposited on the sea-floor, their accumulation eventually forming a bed of considerable thickness. Thus, on removal from the shore it will be readily understood that the finest and lightest particles will travel farther under water than will the grosser pieces, and that the *débris* from the cliff is roughly sorted out by the sea, according to its specific gravity. This principle is well exemplified in fig. 1. The beach is strewn with large blocks; between tide-marks there is a bed of gravel; this is succeeded by small pebbles which pass insensibly into smaller pieces called grit, then into coarse sand, fine sand, sandy clay (or sand and mud), and eventually into clay, or mud. The whole of the deposits may be, and often are, laid over a vast area—the fine clay may be many miles distant from the beach.

From the foregoing it is evident that the deposition of sediment can, normally, only take place within a few miles of the shore, though the distance may slightly vary owing to the action of disturbing currents, especially in shallow water. Beyond the point where this deposition ceases, another kind of formation sets in. The sea is inhabited by countless millions of animals, and as these die, their hard parts, shells, &c., accumulate and make thick beds. The relative position of these shelly deposits is indicated in the diagram. At the point of junction between *f* and *g*, the clay and shells are mingled together, and the remains of marine organisms, naturally, are found more or less in all deposits up to the beach. Marine formations of the kind indicated—especially the sands, clays, and shelly beds, often occur of enormous thickness—several hundreds, in some cases thousands, of feet.

Hitherto we have dealt almost exclusively with the disposal of sediment derived from the sea beach; but sediment is also discharged into the sea at a river's mouth, the material having been obtained from the land through which the river flows, and carried to the sea by the movement of the stream. The shoals at the mouth of the river Thames, for example, have been formed in that manner. We have, however, much grander illustrations of the transporting action of river water in the deltas of the Ganges, Brahmaputra, Nile, Rhine, and Mississippi. Nearly the whole of Holland is in reality the delta of the Rhine, which accounts for the flat and swampy nature of the country, and the peculiar and difficult kinds of foundations met with in building.

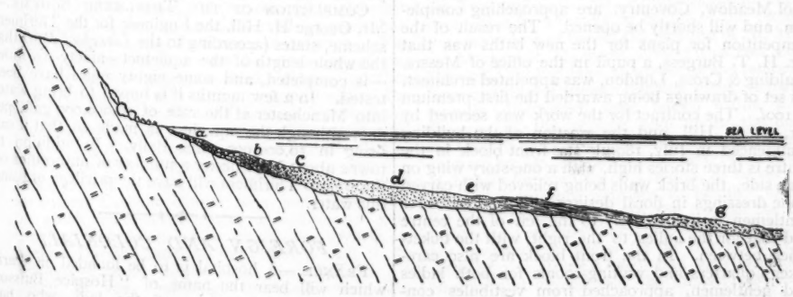


Fig. 1.—*Section of Shore and Sea-floor to show deposition of Aqueous Rocks.*

a—Beach gravel. *b*—Small pebbles. *c*—Grit. *d*—Sand. *e*—Sandy clay. *f*—Clay. *g*—Shelly deposit.

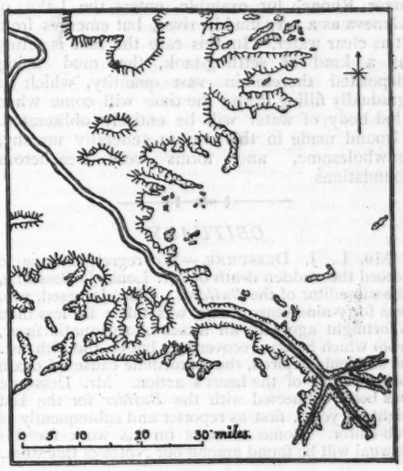


Fig. 2.—*Delta of the Mississippi River.*

The delta of the Mississippi (fig. 2) is, perhaps, the most important—it certainly is the most striking—example of the formation of deposits at the mouths of a large river. Messrs. Humphreys & Abbott state * that the area of this vast expanse of alluvium is 12,300 square miles, and it advances at the rate of 262 ft. yearly into the Gulf of Mexico at a point which is now 220 miles from the head of the delta. The bar forming at the South-West Pass of the river is equal in bulk to a solid mass one mile square and 490 ft. in thickness, and it advances at the rate of 338 ft. per annum. It consists mainly of sediment pushed along the bed of the river. Sir Archibald Geikie, F.R.S., remarks † that the upper reaches of the Adriatic Sea are being so rapidly shallowed and filled up by the detritus brought down by the Po, Adige, and other streams that Ravenna, originally built in a lagoon like Venice, is now four miles from the sea, and the Port of Adria, so well known in ancient times as to have given its name to the Adriatic, is now fourteen miles inland, whilst on other parts of that coast-line the breadth of land gained within the last 1800 years has been as much as twenty miles. The nature of the deposits of which deltas are formed may be gathered from accounts of borings for water near Venice, which reached a depth of over 570 ft., and disclosed a succession of nearly horizontal clays, sands, and lignitiferous beds, the whole indicating an alternation of marine and terrestrial or fresh-water conditions. The sea fronting the Amazon is discoloured for 300 miles by the mud of that river.

The material derived from the denudation of the land is, however, deposited in other situations by rivers than in their estuaries; a certain amount accumulates in favourable spots along the river course, and the formations thus made are known as *fluviatile*. Such deposits are commonly associated with rivers of little velocity (and consequently with a meandering course), and are often spread over the whole breadth of the valley, as is shown in Fig. 3, which represents a section across the river Ouse to the east of Bedford, from Ravensden to Summerhouse Hill.

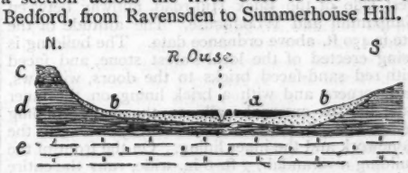


Fig. 3.—*Section across the River Ouse, East of Bedford.*

a Alluvium, or mud deposit. *b* River gravel.
c Boulder clay. *d* Oxford clay. *e* Great Oolite.

Many English cities are built in valleys on the gravels, sands and silts formed in past times

* "Report on the Mississippi River," 1861.
† "Text Book of Geology," 1882, p. 390.

by the action of rivers, and the student will see that this is closely connected with the subject of foundations. As river deposits are so local, they vary materially, even in short distances, in their general character, and he will choose the best foundation who knows most concerning their nature and distribution.

Lakes into which streams discharge their burden must in course of time be filled up; deposits of this nature are called *lacustrine*. The river Rhone, for example, enters the Lake of Geneva as a very muddy river, but emerges from it as clear water. In this case the lake is acting as a kind of settling-tank, the mud being deposited therein in vast quantity, which is gradually filling it up; the time will come when that body of water will be entirely obliterated. Ground made in this way is generally marshy, unwholesome, and forms very treacherous foundations.

OBITUARY.

Mr. L. J. Dessurne.—We regret to have to record the sudden death of Mr. Louis J. Dessurne, the sub-editor of the *Builder*. The deceased, who was forty-nine years of age, was taken ill less than a fortnight ago with an attack of rheumatic fever, from which he was recovering; but on the 18th inst. he suddenly expired, the immediate cause of death being failure of the heart's action. Mr. Dessurne has been connected with the *Builder* for the last eighteen years, first as reporter and subsequently as sub-editor. Some remarks on his work for this journal will be found among our Notes of this week.

GENERAL BUILDING NEWS.

Salvation Army Citadel, Aberdeen.—On the 17th inst. the foundation-stone of the new Salvation Army Citadel, Aberdeen, was laid by Lady Aberdeen, assisted by the Earl. The building is in the Scotch Baronial style, and has a frontage of 150 ft. by an average depth of 100 ft. The material used for the construction will be of Kemnay granite. The building will provide, on the first floor, a hall to accommodate 1,500 persons, and offices for the carrying on of the work in the north of Scotland. Dwellings are also provided for the officers. One of the main features of the elevation is the tower 25 ft. square, which rises above the main building to a height of 150 ft. The total cost, when the work is completed, will be about 22,000*l*. The building has been designed by Mr. James Souttar, architect, Aberdeen.

Restoration of Withybrook Church, Warwickshire.—On the 16th inst. Withybrook Church was reopened, after restoration, by the Bishop of Coventry. The church was built in the latter part of the fourteenth century, but there are many additions of the fifteenth century, and the architecture includes Early English, Perpendicular, and Decorated styles. The building has a large chancel, and a short nave with north and south aisles. The tower—a low, square one, standing at the west end—is without a spire. The church had become so dilapidated that it was closed in October, 1889. It has been entirely re-roofed, the pillars and walls have been cleaned to expose the original surface, and the latter pointed, and in re-glazing the windows all the ancient glass has been used again. It has been necessary to renew all the woodwork except the pulpit and the altar, which have been retained. Previous to the alterations there were seats for 107, now there are 171. The tower has been strengthened and made watertight, and the church furniture has been augmented by several memorial gifts. It still remains necessary to reseat the chancel and repair the bells. The work has been carried out by Messrs. Law & King, of Lutterworth, under the superintendence of Mr. E. Turner, architect, Leicester.

Convalescent Home, Woodhouse, Loughborough, Leicester.—The Duchess of Rutland laid the foundation-stone recently of the Charnwood Forest Convalescent Home, which will be situated near Woodhouse. The building is situated on the west side of the Buck Hill-road, midway between Nanpantan and Woodhouse. The altitude of the site is 450 ft. above ordnance data. The building is being erected of the local Forest stone, and faced with red sand-faced bricks to the doors, windows, and corners, and with a brick lining on the inner side, all the external walls to the main building being erected with a 2-inch cavity between the stonework and the inner lining. On the front of the building a verandah, 7 ft. 6 in. wide, runs the entire length. This is partly covered with glass. The building consists of ground, first, and second floors, with a corridor running the entire length of each. The entrance hall—27 ft. by 16 ft.—is approached from the centre of the verandah, and will be available as a committee room, and is divided from the men's and women's corridors by swing-doors. The remainder of the front consists of three sitting-rooms and matron's room. The back portion of the main building ground floor consists of dining-hall, capable of seating fifty-six persons; sitting-room, china and store-rooms. Main staircases at either end lead to the men's and women's bedrooms. At the rear are kitchen, scullery, larder, and other offices opening into large paved yard, at the side of which a coach-house is being erected. Lavatory accommodation, lined with white glazed bricks, is provided for both sexes at either end of the building. Provision and store cellars with heating chamber are provided in the basement. The first floor is so arranged that the bedrooms open direct into the main corridor, and consists of nine bedrooms, store-room for patients' clothes, bathrooms, housemaid's closets, &c., and by the arrangement of doors in the corridor, a portion of the women's bedrooms can be made available for the men's accommodation if found necessary. The second floor is approached by the continuation of the staircase on the women's side, and contains seven bedrooms and cistern-room, with corridor. It is proposed to devote the whole of this floor to the women patients. In regard to the ventilation of the building, fresh air inlet tubes are introduced where required, and exhaust flues connecting each room, running into the chimney shaft, and the windows are open to the ceiling level. The house is designed for forty-five patients. The sitting and bedrooms will be heated by open firegrates, and the corridors and dining-hall by hot water. The water for the Home is being lifted by a three-trough water-wheel pump from the filtered water well at the Nanpantan reservoir through a 3 in. rising main, and is now supplying water for the building operations. Brindle tile will be used for the roofs, and will be supplied by Mr. J. Peake, Tunstall; the bricks for facings from Messrs. Tucker & Son, of Loughborough, and the stone from Messrs. Drabble & Co., Farley Darley Dale quarry. The cost of the structure complete will be about 6,000*l*., and the contract is being carried out by Messrs. W. Moss & Son, of Loughborough, under the direction of the architect, Mr. Geo. H. Barrowcliff, of Loughborough.

Board School, Cardiff.—On the 14th inst. a new board school was opened at Saltmead, Cardiff. The walls of the building are faced with Newbridge stone, with dressings and string-courses of brick and Bath stone. Accommodation is provided for 380 girls on the ground floor of main block, there being two class-rooms capable of holding 70 in each, and four with accommodation for 60 respectively. A corridor 70 ft. long by 11 ft. wide is provided in the centre of this block, and the several class-rooms open from this. The space allotted for hats, cloaks, and lavatory accommodation also opens from this corridor, and at one end a room for the teachers with store and other necessary accommodation is provided. The boys' school is situated on the first floor above the girls' school, reached by a stone staircase. The accommodation provided for the boys is the same as that for the girls. Similar corridors, lavatories, and teachers' rooms are provided on this floor. The infants' school is situated to the left of the main block looking towards the Penarth Railway. In it accommodation is given for 468 infants. There is one large schoolroom with desks for 108 and gallery for 72, and three class-rooms with accommodation for 60 and another for 108. The large schoolroom is divided from the adjoining by means of a sliding partition, and when this is open a room 63 ft. long by 23 ft. is obtained. The main doors are so constructed that they will open either way. The cookery kitchen is situated near the main entrance from Rutland-street. A lavatory is provided for this school, and also scullery. The playgrounds throughout are laid with Hartnell's paving, and covered playgrounds are provided both in the boys', girls', and infants' playgrounds. The caretaker's house is on the opposite side to the infants' school. The sanitary accommodation has been supplied and fixed by Mr. George Jennings, of Lambeth. Fresh air will be admitted to the building at the level of windows and extracted above by means of Messrs. Boyle's air-extractors. The floors between the boys' and girls' schools are made of fire-proof construction, and the fittings throughout are of pitch-pine varnished. Messrs. E. Turner & Sons, have been the contractors, and their contract amounted to 11,703*l*. The architect for the building was the late Mr. J. P. Jones, and since his death the surviving partners of the firm (Messrs. Richards & Budgen) have superintended the carrying out of the works.

Baths, Coventry.—The new public baths in Pool Meadow, Coventry, are approaching completion, and will shortly be opened. The result of the competition for plans for the new baths was that Mr. H. T. Burgess, a pupil in the office of Messrs. Spalding & Cross, London, was appointed architect, his set of drawings being awarded the first premium of 100*l*. The contract for the work was secured by Mr. C. G. Hill, and the erection of the building commenced in July, 1892. The front block in the centre is three stories high, with a one-story wing on each side, the brick walls being relieved with carved stone dressings in floral designs. The entrance for gentlemen is immediately to the left of the centre and that for the ladies to the right, with the ticket-office between. In the front block are also caretaker's quarters and waiting-rooms for both ladies and gentlemen, approached from vestibules connected with the respective entrances. From the gentlemen's first-class waiting-room access is gained to the gentlemen's private baths, of which there are ten, each provided with a shower apparatus, and to the first-class or exhibition swimming bath, 35 ft. by 90 ft., with a water depth ranging from 3 ft. to 7 ft. The platform around is 4 ft. 6 in. wide, and down the two sides and at one end are dressing-boxes with half-length doors. Above the dressing-boxes a gallery is carried all round the bath for spectators, the gallery being reached by the main staircase in the front block. The roof is supported by upright columns and wooden beams elliptical in shape, and has a continuous skylight nearly the whole length of the bath, and the ventilation is worked from the platforms. The bath is lined with white glazed bricks, with blue ones introduced in various patterns at intervals. A shower-bath is placed behind the diving-board. The other two swimming-baths—the ladies' and the second-class men's—are similar in size, construction, and appointments, except that there is no gallery, and the second-class men's bath has adjoining it a "soap-hole." There are ladies' first and second-class private baths, reached from the vestibule. The men's second-class baths, swimming and private—of which latter there are twenty—are reached by a long corridor. By this corridor also the laundry and necessary appurtenances are reached. The machinery in this department will be driven by a Tangye's 4-h.p. steam-engine. The boiler-house, in which are two Cornish boilers, adjoins. A tank for the storage of water for the private baths is placed at the top of the building, available whenever the town supply may be temporarily cut off. The foreman in charge of the works is Mr. W. McCarthy, and the clerk of the works Mr. A. Davies.

Board School, Sheffield.—The newly-erected board school at Firs Hill, Sheffield, was opened on Monday by Mr. Benjamin Fletcher, J.P., vice-chairman of the Sheffield School Board. The building will accommodate about 360 boys and girls, and about the same number of infants. The infants' department is situate on the first floor, and consists of schoolroom and three class-rooms, the arrangement of the upper story being somewhat similar. Mr. J. B. Mitchell-Withers was the architect, and Messrs. John Chambers & Sons the builders. The warming apparatus was put in by Messrs. Newton, Chambers, & Co.

Convalescent Home, Clent, Worcestershire.—On the 21st inst. the foundation stones were laid at Clent of the new Convalescent Home in course of erection there in connexion with the Order of Foresters. The structure is to be of red brick with stone facings, and is Gothic in character. A verandah will front the building. Accommodation is to be provided for thirty patients. The architect for the work is Mr. B. Corser, Birmingham, and the builders Messrs. Guest & Sons.

Parish Room, Bristol.—The parish room of St. Martin's, Upper Knowle, was opened on the 16th inst., by the Rev. G. Dunlop, the vicar of the parish of Knowle. The room is intended for Sunday-school, club meetings, concerts, lectures, &c. It is constructed of timber, and has gabled bays and porch. The ventilation is assisted by two exhaust air-pumps (Boyle's). The heating is by Fletcher's chancel stoves. Mr. Thomas Broad, of Totterdown, is the contractor, and the architect is Mr. William Paul, of Bristol.

SANITARY AND ENGINEERING NEWS.

Drainage of Holbeck Undercliff, Scarborough.—On the 15th inst. Colonel John Ord Hasted, R.E., conducted an inquiry on behalf of the Local Government Board respecting an application by the Town Council for permission to borrow the sum of 2,500*l*. for the purposes of the drainage, &c., of the Holbeck Undercliff. Mr. Martin Samuelson, C.E., Hull, was the engineer engaged to make a report on the efficient drainage of the whole of the Undercliff, and his summary of estimates was—(1) removing earth and draining the Undercliff, 3,177*l*. 13s.; (2) sea-wall south of steps, 687*l*. 6s.; (3) work to complete the existing stone wall, 163*l*. 7s. 6d.; (4) two groynes on the foreshore, 1,076*l*. 12s. These items amount to 5,104*l*. 18s. 6d., to which is added 510*l*. 9s. 10d. for contingencies. The Town Clerk (Mr. J. E. T. Graham) said that the Corporation had already obtained the sanction of the Board with respect to items 2 and 3; item 4 was not indispensable, and item 1 had been so reduced as to bring it within the sum for which powers were asked to borrow.

Completion of the Thirlmere Scheme.—Mr. George H. Hill, the Engineer for the Thirlmere scheme, states (according to the *Liverpool Post*) that the whole length of the aqueduct—ninety-six miles—is completed, and some eighty miles have been tested. In a few months it is hoped to bring water into Manchester at the rate of 10,000,000 gals. per day, although the aqueduct is made so that it can bring in 50,000,000 gals. daily. In addition to towns about Manchester a number of authorities on the way to Thirlmere will have the privilege of using this water.

FOREIGN AND COLONIAL.

France.—A hospital is to be founded in Paris which will bear the name of "Hospice Buisson Jacob," after the name of the lady who has founded it.——There is talk of inaugurating the statue of Balzac, on the Place du Théâtre Français, on the 3rd of March next year.——M. Formigé, the well-known architect, has been commissioned to

design the pedestal for the monument to Washington and Lafayette, which has been offered to the City of Paris by a committee of Americans, and will be erected on the Place des États Unis. M. Bartholdi is the sculptor.——M. Jacques Hermant is the architect of an establishment just completed near Versailles to receive young children whom their mothers have not the means of bringing up. The building has been built with special reference to hygienic conditions, and is to be called the "Pouponnière de Porchefontaine.——The little town of Saint Maur les Fossés, near Paris, has opened an interesting art exhibition.——The works for the new bridge of Puteaux have just been commenced.——M. Joubin, a former pupil of the École Française at Athens, has been commissioned to commence a series of excavations at Clazomenæ in Ionia.——At Angers, in the curious old mansion known as the "Maison de Pincé," a grand composition by M. Lenepveu is being fixed up, representing the entry of Francis I. into Angers.——A children's convalescent hospital is to be built at St. Genis, near Lyons, at a cost of two million francs. ——MM. Bauhain and Godefroy, architects at Paris, have gained the first prize for the open competition for the Savings Bank in the town of Flers (Orne); the second prize has been gained by M. Forget, also a Paris architect; and the third by M. Amiort, architect at Flers.——The prize for the open competition for a monumental fountain to be erected in the Place Croix-en-Bourg, in the town of Toul, has been awarded to MM. Bauhain, architect, in Paris, and Schnegg, sculptor. The second prize has been awarded to M. Clements, at Paris, and the third to M. Siolly, architect, at Nice.——M. Moriceau, architect, at Ancenis, has been commissioned with the execution of the pedestal of the statue for the poet Joachim, of Bellay, and the statue is to be erected in this town.——Very shortly the monument to the memory of the painter Maxime Lalanne will be inaugurated at Bordeaux. It is the work of the sculptor Granet, and is composed of a stele, round which climbs a shrub, the branches of which reach to the bust of the artist. In front of the stele Genius sits on the trunk of a tree, drawing on a slab.——At Vendôme a public fountain is to be erected, on the summit of which is to be placed the bust of Madame Clémence Badaire, a poet of much talent.——The eminent sculptor, Bartholdi, has finished a very large allegorical composition of Switzerland protecting Alsace, and supporting wounded France, whilst Charity presents her with some children. This work is to commemorate the generosity of the Swiss when face to face with the French soldiers during the war of 1870. It is to be erected in Bâle.——A bust of the celebrated oculist Daviel has just been inaugurated at Marseilles.——One of the oldest monuments of Normandy, the Abbey of Saint Wandrille, where the Merovingian race became extinct, is shortly to be placed in the market. In the Abbey is the curious chapel St. Saturnin, dating from the eleventh century.——The death, at the age of forty-nine, is announced of M. Antoine Elchinger, architect and overseer of the town of Troyes.——We have heard of the death of M. Gaston Thys, at Rome. He was a painter, late pupil of the Academy Schools at Lille, and obtained the Prix de Rome in 1889, for his picture of "Jesus Healing the Paralytic."

DENMARK.—A memorial of the late Baron Theophilus Hansen, the celebrated Danish architect, for many years resident in Vienna, has been issued by Messrs. Anton, Scholl, & Co., of that city, entitled "Theophilus Hansen und seine Werke," accompanied by numerous engravings, &c.——The well-known sculptor L. Hasselriis is at work in Rome on the bronze statue of "Denmark" to be erected in Copenhagen in commemoration of the Royal Golden Wedding.——The municipality of Copenhagen have under consideration plans for the building of six new Crown churches in the capital, owing to the development of the latter.——The Copenhagen Bourse is being ornamented with windows of stained glass bearing the escutcheons of the principal commercial cities in Europe, from designs by Professor Fenger, Crown Architect.——The restoration of several ancient Danish structures is to be taken in hand, including the historical Helligaandskirke in Copenhagen (Church of the Holy Ghost), at a cost of 60,000kr.; the Storehedinge Church, near Stevn, under Professors Petersen, Fenger, and others, supervising, and the old Town Hall in Odense, Island of Funen. This structure was built in about 1450, and served as town hall down to 1882, having been restored in 1795. The style and construction were found to be of undoubted foreign origin.——Vallö Castle, another historical relic, is also being restored, whilst the excavations of ruins of the Castle of Vordingborg have been continued this summer. The outer walls are being laid bare, and the excavations of the site of the main building are next to be commenced.——In the town of Aalborg, Jutland, the foundations of an ancient Catholic church have been discovered, on which Professor Bergsöe, a well-known antiquarian, has furnished a report.——*Apropos* of ancient Danish churches, the oldest is said to be Jellinge Church, near Veile, in Jutland, in which in 1874 paintings in chalk were discovered in Byzantine style, dating from about 1200. It is of limestone with rounded arches.——Two important engineering works are at present in progress in Denmark, viz., the construction of the free harbour at Copenhagen, and the draining of the Lammefjord. On the former, work is carried on day and night with some 3,000 hands, and the harbour and works are to be completed in two years. The quay-line will be about 3,000 ft. in length, and have a depth of 37 ft. The walls, quays, &c., are being constructed of Öland stone, from the Baltic island of that name, never hitherto used in Denmark, Portland cement, and granite. The cost of the work referred to above will cost some 10,000,000 kr., and it is anticipated that an equal sum will be required for offices, warehouses, railway lines, electric installations, roads, &c. The second engineering enterprise referred to is the draining of the Lammefjord. The company carrying out the same has now drained 1,120 acres, valued at 808,000 kr. The total assets amount to 1,222,000 kr.

ICELAND.—The new suspension bridge across the river Ölevesaa in Iceland, constructed by English engineers, and the first structure of this kind in the northern island, has proved of such use that the Althing has voted a sum of 75,000 kr. towards the construction of a similar bridge across the river Tjorsaa, in Ranjárvallassyssel. A native engineer, Herr Ripperda, has prepared the necessary plans and estimates.

MISCELLANEOUS.

APPOINTMENT.—We hear that Mr. Richard S. Henshaw, Secretary of the Institute of Builders (Incorporated), has been appointed Secretary of the Builders' Accident Insurance, Limited, and the Central Association of Master Builders of London, in succession to his father, the late Mr. J. S. Henshaw.

THE CHINESE TELEGRAPH SYSTEM.—According to a recent report of the United States Minister at Pekin, the Chinese land telegraph line has been joined to the Russian system, and messages can be sent to any part of the world from any telegraph station in China. The Chinese system reaches Helampo in the north, where the connexion is made with the Russian lines, Wenchuen in Kirin in the north-east, Suchan in Kansu in the north-west, Aichow in Hainan in the south, Takao in Formosa in the south-east, and Zengyueh close to the Burmah frontier in the south-west. The only province not reached by the telegraph is Hunan, which still remains opposed to all foreign innovations. There are 167 stations, the largest number (34) being in Kuantung, and the smallest (2) in Shensi. Since the connexion with the Russian system has been made, the cable companies have added 15 per cent. to their rates, but messages sent over the Chinese lines are not increased over the former rate of 8s. 4d. per word. The service is rapid and satisfactory, and senders of messages have the right to choose whether the transmission shall be by the cable or land lines.

THE SUBSIDENCE AT KELVIN BRIDGE, GLASGOW.—The situation of the Kelvin Bridge remains somewhat the same, says the *Glasgow Herald*, although the subsidence seems to be slowly going on. It was reported to Mr. Whyte, the Master of Works, that the workmen engaged in the boring operations at the base of the tenement at the south-west corner of the bridge had been successful in penetrating to the old coal workings, a distance of 28 ft. below the surface. Fourteen feet of earth and the like number of feet of rock had to be bored. This disclosed a condition in the old coal workings which seems to corroborate the theory that has been all along put forward that the pumping operations in connexion with the construction of the railway have caused a subsidence of the ground below the tenement. Although the workings are 3 ft. 8 in. in depth, they were found almost entirely free from water, a few inches only remaining. From this state of matters it is inferred the absence of the water support has caused the workings to fall in. The workmen are now engaged making a way into the workings through the loose heaps of "shivers," and this accomplished, doubtless the cause of the subsidence will be definitely known. With regard to the pillar of the north parapet which first gave way, an entirely different state of matters has been disclosed. The miners have been successful in reaching the old coal workings below, but they have been found to contain 4 ft. of water.

STATE OF THE CITY CHURCHES.—At the Consistory Court of London, held at St. Paul's Cathedral on the 17th inst., before the Chancellor of London, Dr. Tristram, Q.C., Mr. Arnold Statham made an application for a faculty on behalf of the rector and churchwardens of the united parishes of St. Magnus the Martyr, St. Margaret, New Fish-street, and St. Michael, Crooked-lane, to authorise the removal of a large quantity of human remains which, it had been recently discovered, were buried within a short distance of the surface and under the floor of the Church of St. Magnus, and which had been pronounced by Dr. Sedgwick Saunders, Medical Officer of Health for the City of London, to be very offensive and a nuisance injurious to health. Owing to the decay going on beneath, the floor of the church had recently subsided in many places. Dr. Hoffman, her Majesty's Inspector for the Burial Acts Department of the Home Office, had also inspected the church, and agreed that the human remains ought to be removed. An Order in Council was issued on May 16 dealing with the matter on sanitary grounds, but owing to the intense heat it was undesirable for the workmen to commence just yet. Evidence was given that according to estimates it would cost the parishes some 1,300*l.* to remove the bodies. In the course of the evidence it was mentioned that Sir Christopher Wren, who designed the church after the great fire of London in 1666, had exercised such foresight as to provide an archway in the tower, so that in case the traffic over old London Bridge increased, a cutting could be made through the tower to admit of the traffic being taken in part through it. It was many years afterwards found necessary to broaden the bridge, and it was then seen that Sir Christopher had anticipated this difficulty, and provided the arch through which a footpath over the bridge was subsequently made to lead, without injury to the fabric. The Chancellor of London granted the faculty prayed for.—*Morning Post.*

AMERICAN RAILWAYS.—The total mileage of railways in the United States at the end of 1892, as we learn from "Poor's Manual" for 1893, was 175,223 miles, which shows an increase during the past year of 4,429 miles, or 2·6 per cent. Full statistics of operations were received by Poor from companies working 170,607 miles, or 97½ per cent. of the total mileage, and from their data the annexed statement was compiled. The revenue train-mileage, exclusive of elevated roads, was 865,000,000; the passenger mileage, 13,697,000,000; the freight ton-mileage, 84,448,000,000. The gross traffic earnings, in British equivalents, amounted to 241,000,000*l.*; working expenses, 169,400,000*l.*; net earnings, 71,600,000*l.*; other receipts, 23,000,000*l.*; total available revenue, 94,000,000*l.* The payments for interest absorbed 47,800,000*l.*, and in dividends 16,600,000*l.* The ton-mile rate for goods was 0·48d.; the average passenger fare, 1·07d.; being the lowest ever recorded. The receipts from passenger fares per mile were 344*l.*; the average number carried per mile was 3,375; and the average trainload, 42·29. The total payments of interest and dividends amounted to 3·01 per cent. The rolling stock of the railways of the United States at the close of 1892 comprised 35,754 locomotives, 34,221 passenger carriages, and 1,168,867 freight cars.

ST. MAGNUS THE MARTYR.—In granting a faculty for sanitary improvements (see our "Note" of 12th inst., and a paragraph on this page, Dr. Tristram, Q.C., is reported to have expressed his regret that when this church's income, in part, was dealt with by the Ecclesiastical Commissioners, no provision was made to meet the present contingency: 1,570*l.* has been set aside for repair of the fabric, but as matters now stand the cost of removing the remains (of from 300 to 400 persons), estimated at about 1,750*l.*, will fall upon the parishioners. In the case of St. Martin, Ludgate, a rate of 1s. in the pound has just been imposed, there being no available fund for defraying the charges, 1,500*l.*, of similar removal. Mr. E. B. I'Anson, architect, will supervise the repairs at St. Magnus. Miles Coverdale's body was removed hither from St. Bartholomew's-by-the-Exchange on October 4, 1840. The tower was restored in 1885 by Messrs. Dove Bros., under the directions of Mr. A. Billing. On April 24, 1886, we published Mr. E. H. Sedding's measured drawings of the tower, which gained the R.A. First Silver Medal, 1885.

CLOCK, PUBLIC HALL, EARLESTOWN, LANCASHIRE.—A new public hall has just been erected by the Local Board of Newton-in-Mackerfield, from the designs of Mr. T. Beesley, architect, Warrington. An eight-days' turret quarter-chime clock has been fixed in the tower. The clock strikes the hours upon a bell of about 12½ cwts., and the ding-dong quarters upon two smaller bells, the total weight of the three bells being about one ton. The time is shown upon four external dials, 6 ft. 6 in. each in diameter, which are illuminated by gas at night. The gas is turned on and off by an automatic gas apparatus, according to the length of the day. The necessary work has been done by Messrs. Wm. Potts & Sons, clock manufacturers, of Leeds, from instructions received from Mr. C. E. Brierley, C.E., Surveyor and Clerk to the Board.

ENTERIC FEVER AT WORTHING.—In Worthing enteric fever is maintained in a slumbering form, and it cannot yet be stated whether the diminution is due to the abandonment of the specifically polluted water or to the cessation of the cause of origin. The local authority having finally determined to abandon their existing water-supply, the question has arisen as to the best means of supplying the wants of the public pending the construction of new works. One proposal, which seems to have been strongly pressed, was to resort to a process of sand filtration of the water from the suspected wells. Apparently this proposal is based on the modern experiences as to filtration, notably at Altona; but the conditions do not appear to us to be in any way parallel. A remarkable, although partial, elimination, of micro-organisms from the Elbe water was effected at Altona as the result of filtration; but Professor Koch distinctly stated that it was not the sand filtration which effected the result attained. On the contrary, the sand itself signally failed, and it was only when the sand layers were uniformly coated with a layer of river mud and organic matter that the elimination of micro-organisms was attained; and even then Professor Koch admitted

COMPETITION, CONTRACTS, AND PUBLIC APPOINTMENTS.

COMPETITION.

Nature of Work.	By whom Advertised.	Premiums.	Designs to be delivered.
*Alterations and Extensions to Workhouse	Stockport Union.....	30*l.* 10*l.* 5*l.*	Dec. 1

CONTRACTS.

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
Church, Marsden, near Huddersfield	.....	John Kirk & Sons	Aug. 26
Additions to "Bay Horse" Inn, Pitsmoor, Sheffield	.....	G. A. Wilson.....	Aug. 29
Additions to Infirmary	Keighley Union	J. Judson & Moore....	do.
*Sewerage Works.....	Burton-on-Trent Corp.	*Official*	do.
*New Copper Tubes to Heater	Wandsworth & Clapham Union	do.	Aug. 30
*Making-up Roads, Essex	British Explosive Syndicate	do.	do.
*Dwelling-house, Northern Hospital	Met. Asylums Board..	do.	do.
Retort House at Gasworks.....	Rochdale Corporation	do.	do.
House, Cromwell-road, Peterborough	.....	J. G. Stallebrass.....	do.
Cottage, Offices, &c.....	Barnsley Town Coun.	J. H. Taylor.....	do.
*Works and Materials	East Barnet Valley Local Board	G. W. Brumell.....	Aug. 31
School Buildings, Pendleton, Wigan.....	Howarth & Son	.....	do.
*Surface Drains, &c.	Hoylake & West Kirby Local Board	*Official*.....	Sept. 2
*Paving Works.....	Camberwell Vestry ..	do.	Sept. 4
*Painting, &c. Girls' School, Sutton.....	South Metro. School District	do.	do.
*Alterations, &c. to Fire Station	Richmond Town Coun.	E. J. Lovegrove	do.
*Making-up Roads	Toxteth Park Loc. Bd.	J. Price	do.
Alterations to Asylum, Enniscorthy	Commrs. of Control ..	C. A. Owen	do.
Alterations to Town Hall	Guildford Town Council	F. T. Maltby.....	do.

CONTRACTS—*Continued.*

Nature of Work or Materials.	By whom Required.	Architect, Surveyor, or Engineer.	Tenders to be delivered.
*Infectious Diseases Hospital.....	Stratford-on-Avon Twn Council	*Official*	Sept. 6
*Road Materials	Maidstone U.R.S.A. ..	do.	do.
Twelve Cottages, Barnstaple.....	H. Ballinger.....	W. C. Oliver.....	do.
*Additions to School of Science and Art ..	Bromley Local Board..	Potts, Son, & Hennings	do.
Church Restoration, Doddington, Wooler, Northumberland.....	.....	Geo. Reavell.....	Sept. 6
Hospital	Ashby de la Zouch, Union	J. W. Metcalf	Sept. 6
*Sewerage Works	Ware U.R.S.A.	Bailey-Denton, Son, & North	Sept. 9
*Mill Hill Drainage	Hendon Local Board ..	S. S. Grimley	Sept. 9
*Broken Granite, Flints, &c.	Barking Town Loc. Bd.	C. J. Dawson	Sept. 11
*Supply of Granite.....	Staines Local Board ..	*Official*	Sept. 12
Wards at Lunatic Asylum, Mickleover, Derby	Visitors	J. Somes Story.....	Sept. 13
*Infectious Diseases Hospital.....	Birkenhead Corp.	*Official*	Sept. 13
*Laying Concrete Flags.....	Walthamstow Loc. Bd.	G. W. Holmes	Sept. 13
Alterations to Vicarage, Shirenewton, nr. Chepstow	.....	Seddon & Carter.....	No date

PUBLIC APPOINTMENTS.

Nature of Appointment.	By whom Advertised.	Salary.	Applications to be in by
*Two Instructors.....	Kent County Council	.....	Aug. 19
*Clerk of Works	Hoylake and West Kirby Local Board ..	3*l.* 3*s.*	Sept. 1
*Borough Engineer and Surveyor.....	Plymouth Corporation	350*l.* &c.	Sept. 4
*Sanitary Engineer.....	Truro U.S.A.	.....	Sept. 4
*Clerk of Works	Toxteth Park Loc. Bd.	3*l.*	No date
*Teacher and Instructor	Gravesend Municipal Technical Schools....	....	No date

Those marked with an Asterisk (*) are advertised in this number. *Competitions, p.* iv. *Contracts pp.* iv., vi., *and* viii. *Public Appointments, p.* xviii.

that organisms of pathogenic type probably passed through. How this mud layer, which is essential, was to be secured at Worthing did not transpire; and we may fairly assume that it would not result from the use of the well water alone. Apparently the Town Council submitted the matter to Dr. Thorne Thorne of the Local Government Board, who is reported to have sent a written answer, reverting to Professor Koch's experience to the effect that, "even under favourable circumstances, sand filtration cannot give absolute protection against the danger of infection." Under these circumstances the Town Council abandoned the scheme, and decided to make some arrangement with the Shoreham Water Company for a temporary supply of water for Worthing. In the meantime Dr. Theodore Thomson is continuing his investigations, especially as to the actual source of the original contamination.—*Lancet.*

THE PLUMBERS' COMPANY.—The Lord Mayor of London (Sir Stuart Knill, Bart., LL.D.) attended a meeting of the Sanitary Authorities and Plumbers of Liverpool on the 18th inst., the Deputy Mayor of Liverpool (Mr. J. De Bels Adams) in the chair. The Worshipful Company of Plumbers, London, of which the Lord Mayor of London is the present Master, was represented by its Clerk, Mr. W. R. E. Coles. The Lord Mayor, in the course of his remarks, expressed disappointment that the Plumbers' Registration Bill had been thrown out by the Standing Committee, especially in view of the fact that the consensus of opinion throughout the country was in favour of it. The damage and danger resulting from unqualified plumbing were notorious, and medical men said that one-third of the deaths from preventable diseases were due to bad plumbing. Therefore they naturally thought that in the interests of the whole country the Bill would have been passed. They wanted to have qualified plumbers so that the public might be protected, especially as regards the hidden work which belonged to the plumbing craft; and they wanted to see dishonest plumbers prevented from practising the trade. —Dr. Vacher then moved, "that this meeting assembled to consider the necessity for systematically promoting technical education, examination, and registration of plumbers, with the object of improving the sanitary efficiency of plumbers' work, and providing the public with the means of distinguishing qualified from unqualified men, desires to record its opinion that the principles of the Plumbers' Registration Bill and its main provisions are deserving of general approval in the interests of public health; and that copies of this resolution be forwarded to the members of Parliament for the city of Liverpool and North-east Lancashire and to the Local Government Board, with an expression of the desire of the meeting that active steps be taken to recommit the Bill to the Standing Committee, or otherwise provide for early legislation on the subject." —Mr. Edmund Kirby, F.R.I.B.A., seconded, and said that his experience as Chairman of the Examination Committee had convinced him that in order to have good plumbers they must have registration.—Dr. Taylor, Mr. H. Sheppard, Rev. Canon Lester, and Councillor Scott supported, and the resolution was unanimously adopted.—Mr. G. B. Cherry moved a vote of thanks to the Lord Mayor. Mr. Watkin Hall seconded, and the vote was passed, as was another motion conveying thanks to the Lord Mayor's Deputy for presiding.

CAPITAL AND LABOUR.

THE CARPENTERS' AND JOINERS' STRIKE AT SOUTHAMPTON.—We learn that, as far as the building trade is concerned at Southampton, the strike of carpenters and joiners, which has now lasted for some months, is practically at an end. The arrangement arrived at only awaits the ratification of a meeting of the masters.

CARPENTERS' STRIKE, ROCHESTER AND CHATHAM.—The Mayors of Rochester and Chatham, who had been called upon to arbitrate in the dispute between the working carpenters and joiners and the master builders of that district, have just published their award. The men, who have been on strike eleven weeks, demanded a wage of 8d. per hour, being an increase of ½d., and the arbitrators, after hearing the evidence from both sides, have fixed the rate of pay at 7¾d. On the other points the award is in favour of the employers. Both parties agree to accept the award as binding upon them for three years.

RECENT PATENTS.

ABSTRACTS OF SPECIFICATIONS.

13,244 and 13,245.—*E. Turner.*—Two improvements in house drainage are devised by these inventions. One a kind of D-trap, which is affixed to a grid and removable when mud or sediment is to be taken from the drain. When in its ordinary position a ridge is formed and a trap constituted preventing obnoxious smells entering the base or container and ascending into the atmosphere. The second invention is a self-flushing box-trap connected to the grid of the drain, which when the grid is raised causes the water collected in the base or container to rush through the sewer-pipes, but when the grid is in place the box is closed with an air-tight joint preventing smells from coming up the drain.

15,661.—MOSAICS: *R. Cochrane.*—According to this invention, rods are employed to build up a pattern before using cement, and the square patterns formed are afterwards sliced off to form designs for mosaic work.

16,415.—PARQUET FLOORS AND WALL LININGS: *M. C. Turpin.*—To avoid the effects of expansion or contraction under damp or heat, a combination is employed, by means of this invention, of the tongue and groove joints, by which the sections are united, with a dovetail joint by which they are at the same time firmly united to the cement upon which they are bedded.

508.—IMPROVED PLASTER: *J. C. Bloomfield.*—A plastering compound is made of hydraulic or semi-hydraulic limes and barytes or a blue-tinted finishing plaster is made by mixing these with finely-ground raw shale. This plaster dries with a hardened polished face superior to parian finish at about half the cost.

7,076.—VENTILATORS: *J. Honeyman.*—This invention relates to an improved form of ventilator which has rigid valves arranged to oscillate in an air trunk, and operated automatically by the passage of air currents through an orifice in the diaphragm in the air trunk itself.

10,407.—HANGING WINDOW-SASHES: *A. James.*—To dispense with sash-weights and pulleys, inclined grooves, rollers, and springs are used, the springs exerting a pressure against the inclined plane which tends to raise the window-sash.

NEW APPLICATIONS FOR LETTERS PATENT.

AUGUST 8.—15,098, H. Burnett, Drain and Soil-pipe Testing Apparatus.—15,102, W. Devoll, Double Syphons for Flushing Water-closets.—15,114, A. Lohlker, Paperhanging Machines.—15,130, J. Bark, Hot Water Supply or Heating Apparatus.

AUGUST 9.—15,178, R. Brownlow, Earthenware Taps.—15,187, E. Wimes, Nails.—15,221, C. Rowland, Drain-pipes.—15,226, W. and J. Oakes, Kilns for Bricks, Lime, &c.

AUGUST 10.—15,273, H. Wood, Laying Fireproof and similar Floors.

AUGUST 11.—15,295, H. James and G. Robinson, Cisterns.—15,325, C. McCombie, Self-acting Burglar-proof Window Fasteners.—15,348, J. Dandy, Pipe for Drains, &c.—15,349, C. Anderson, Siphon Water-waste Preventers.

AUGUST 12.—15,359, A. Bellamy, Travelling Cranes.—15,367, J. Clayton, Window Frames and Sashes.—15,368, J. Barnsley, Stench Trap for use in Lavatories, Baths, Sinks, &c.—15,369, J. Whitehead, Extracting Ventilators or Chimney-cowls.—15,379, J. Thornhill, Clasp-headed Nail.—15,384, J. Martin, Making Bricks, &c.—15,394, B. Pancoast, Chimney-cowls (ante-dated March 27, by direction of Comptroller-General).

PROVISIONAL SPECIFICATIONS ACCEPTED.

8,378, R. Stone, Manufacture of Fireproof Plastic Material for Cement, &c.—13,006, P. Lomax, Ventilation. —13,380, W. Defries, Glass-painting and in Mosaic.—13,423, J. Killick, Heating and Circulating Water.—13,514, G. Croaker, Gully Traps.—13,582, W. Beath, Syphon Cisterns.—13,612, J. H. Adlington, Flushing Cisterns.—13,693, T. Claughton and Others, Ventilators, &c.—13,703, T. Ryland and E. Bird, Machines for Carving Wood and other Materials.—13,804, C. Cunliffe, Nails.—13,826, J. Kemsley and G. Whistle, Water-closets and Manner of Discharging, Flushing, and Ventilating same.—14,004, J. Budd, Brushes for Distempering Walls and Ceilings, &c.—14,043, E. Smith, Chimney-cowls.—14,126, J. Davies, Bricks.—14,177, W. Longmore, Water Gutters or Spouts.—14,185, J. Williamson, Window-sashes and Frames.—14,376, W. Kochs, Firegrates and Mechanical Stokers.—14,542, S. Keun de Hoogerwoerd, Mechanical Fan or Domestic Ventilating Apparatus.

COMPLETE SPECIFICATIONS ACCEPTED.

(Open to Opposition for Two Months.)

18,211, W. Murray and W. Macintyre, Kilns for Pottery, Bricks, &c.—4,013, S. and J. Chandler, Cap or Cowl for preventing Down Draughts in Chimneys.

SOME RECENT SALES OF PROPERTY.

ESTATE EXCHANGE REPORT.

AUGUST 9.—By *Farebrother, Ellis, & Co.*: A plot of f. land, Petersfield, Hants, 270*l.*; an enclosure of f. land, 2 a. 0 r. 18 p., 56*l.*; an enclosure of f. land, 7 a. 1 r. 27 p., 400*l.*; f.g.r. of 5*l.*, reversion in 71 yrs., 200*l.*

AUGUST 15.—By *C. W. Davies*: 258, 260, Liverpool-rd., Islington, u.t. 24 yrs., g.r. 16*l.*, r. 92*l.*, 480*l.*—By *C. E. Dowsett*: 1, Royal-ter., Margate, f., r. 50*l.*, 900*l.*; 6, Royal-ter., f., r. 50*l.*, 750*l.*; 13, Albert-pl., Kensington, u.t. 40 yrs., g.r. 6*l.* 10s. 6d., r. 80*l.*, 1,030*l.*—By *W. J. Collman*: 63, Navarino-rd., Dalston, sold before auction.

AUGUST 16.—By *H. R. Farnan*: 1 to 8, Brunswick-ct., New Kent-rd., u.t. 79 yrs., g.r. 28*l.*, 260*l.*—By *Holcombe & Betts*: 35, Broadley-ter., Marylebone, u.t. 48 yrs., g.r. 5*l.*, r. 32*l.*, 350*l.*; 5, Bryon-street, u.t. 48 yrs., g.r. 10*l.*, r. 22*l.*, 260*l.*; 134, 136, 138, Pomeroy-st., New Cross, f., 870*l.*; 27, Stanton-st., Peckham, f., 210*l.*—By *Hobson, Richards, & Co.*: The lease of 48, 49, Curzon-st., Mayfair, and 24, Half-Moon-st., u.t. 12 yrs., r. 500*l.*, 15*l.*

AUGUST 17.—By *Newbon & Co.*: Two plots of f. land, Birkbeck-rd., Muswell Hill, 64*l.*; 15, Hardings-st., Islington, u.t. 38 yrs., g.r. 6*l.*, r. 34*l.*, 280*l.*; 7, Roden-st., Holloway, u.t. 67 yrs., g.r. 6*l.*, 220*l.*; 3, Vernon-st., Pentonville, u.t. 26 yrs., g.r. 5*l.*, 275*l.*; 315, Roman-rd., Old Ford, u.t. 71 yrs., g.r. 5*l.*, 300*l.*

[*Contractions used in these Lists.*—F.g.r. for freehold ground-rent; l.g.r. for leasehold ground-rent; i.g.r. for improved ground-rent; g.r. for ground rent; r. for rent; f. for freehold; c. for copyhold; l. for leasehold; e.r. for estimated rental; u.t. for unexpired term; p.a. for per annum; yrs. for years; st. for street; rd. for road; sq. for square; pl. for place; ter. for terrace; cres. for crescent; yd. for yard, &c.]

PRICES CURRENT OF MATERIALS.

TIMBER.		
Greenheart, B.G.	ton	9/0/0 0/0/0
Teak, E.I.	load	9/10/0 15/0/0
Sequoia, U.S.ft.cu.		2/3 2/6
Ash, Canada	load	2/10/0 3/15/0
Birch, do.		2/10/0 3/0/0
Elm, do.		3/5/0 4/10/0
Fir, Dantsic, &c.		1/5/0 2/15/0
Oak, do.		2/15/0 5/5/0
Canada		5/10/0 7/0/0
Pine, Canada red		2/10/0 3/0/0
Do. Yellow		2/0/0 4/15/0
Lath, D'ntsic, fath		4/10/0 5/10/0
St. Petersburg		5/0/0 6/10/0
Wainscot, Riga, &c., log		2/15/0 5/0/0
Odessa, crown		2/15/0 5/0/0
Deals: Finland 2nd & 1st std	ton	6/10/0 9/10/0
Do. 4th & 3rd		6/10/0 7/0/0
Do. Riga		7/0/0 8/10/0
St. Petersburg, 1st yellow		9/0/0 13/0/0
Do. 2nd yellow		7/0/0 8/0/0
Do. white		8/0/0 10/0/0
Swedish		7/0/0 15/0/0
White Sea		7/0/0 15/10/0
Canada, Pine 1st		21/0/0 28/10/0
Do. do. 2nd		16/0/0 17/10/0
Do. do. 3rd &c.		7/10/0 10/5/0
Do. Spruce, 1st		8/10/0 11/0/0
Do. do. 3rd & 2nd		6/10/0 8/0/0
New Brunswick		6/0/0 7/10/0
Battens, all kinds		3/0/0 15/0/0
Flooring boards, sq., 1 in. prep. 1st		0/0/6 0/14/6
Do. 2nd		0/7/6 0/11/6
Other qualities—		0/4/6 0/7/0
Cedar, Cuba ..ft.		/4 /4½
Honduras, ..&c		/4 /4½
Mahogany, Cuba		/4 /6½
St. Domingo, cargo av.		/3 1/6
Mexican do. do.		/3½ /4½
Tobasco do. do.		/3½ /6
Honduras do. ..		/4 /5½
Box, Turkey	ton	4/0/0 13/0/0
Rose, Rio		9/0/0 20/0/0
Bahia		8/0/0 18/0/0
Satin, St. Doming		/0/6 0/1/3

TIMBER (*continued*).		
Satin, Porto Rico		0/0/7 0/1/6
Walnut, Italian		0/0/3½ 0/0/7
METALS.		
Iron—Pig, in Scotland	ton	2/2/8½ 0/0/0
Bar, Welsh, in London		5/17/6 6/0/0
Do. do. at works in Wales		5/7/6 5/10/0
Do. Staffordshire, in London		6/0/0 6/10/0
COPPER—British, cake and ingot		45/0/0 45/10/0
Best selected		45/10/0 46/0/0
Sheets, strong		54/0/0 0/0/0
Chili, bars		41/5/0 41/12/6
YELLOWMETAL	lb	0/0/4½ 0/0/5
LEAD—Pig, Spanish	ton	9/17/6 10/0/0
English com. brands		10/0/0 10/2/6
Sheet, English, 6 lbs. per sq. ft. and upwards		12/0/0 0/0/0
Pipe		12/10/0 0/0/0
ZINC—English sheet	ton	21/15/0 0/0/0
Vieille Montagne		22/5/0 0/0/0
TIN—Straits		77/10/0 78/0/0
Australian		79/5/0 79/15/0
English Ingots		84/0/0 84/10/0
Banca		89/0/0 89/10/0
Billiton		85/0/0 85/10/0
OILS.		
Linseed	ton	21/0/0 21/2/6
Cocoanut, Cochin		29/0/0 0/0/0
Do. Ceylon		26/15/0 27/0/0
Palm, Lagos		26/0/0 26/10/0
Rapeseed, English pale		24/0/0 0/0/0
Do. brown		22/5/0 0/0/0
Cottonseed ref.		21/0/0 0/0/0
Oleine		22/0/0 23/10/0
Lubricating, U.S.		4/0/0 5/0/0
Do. refined		5/10/0 12/0/0
TAR—Stockholm	barrel	0/18/6 0/0/0
Archangel		0/12/6 0 0/0

TENDERS.

[Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays*.]

ABERDEEN.—Accepted for additions to City Hospital, for the Town Council. Mr. J. Rust, City Architect, 224, Union-street, Aberdeen. Quantities by Architect:—

Leslie Smith, Aberdeen	£6,897 0 0
George Jamieson, Woodside	2,999 0 0
John Blaikie & Sons, Aberdeen	1,398 5 0
James Bannochie & Sons, Aberdeen	935 12 11
James Wilson, Aberdeen	428 11 0
George Donald & Sons, Aberdeen	368 18 0
James Laing & Co., Aberdeen	44 12 6
James Abernethy & Co., Aberdeen	298 16 8
James Laing & Co., Aberdeen	425 10 6

ABERDEEN.—Accepted for the erection of new Salvation Army Citadel in Castle-street. Mr. James Souttar, architect, 42, Union-street, Aberdeen:—

Masons.—P. Bisset & Son, Aberdeen	£8,200 0 0
Carpenter.—G. Jamieson, Woodside	3,230 0 0
Slater.—G. Farquhar, Woodside	282 0 0
Plasterers.—Roger & Baxter, Aberdeen	470 0 0
Plumber.—James Lumsden, Aberdeen	480 0 0
Painters and Glaziers.—G. Donald & Sons, Aberdeen	500 0 0
Iron and Steel work.—Bladen & Co., Glasgow	312 0 0

ABERDEEN.—Accepted for alterations, &c., to captain pilot's office, &c., North Pier, for the Harbour Commissioners. Mr. Wm. Smith, Harbour Engineer, 15, Regent Quay, Aberdeen. Quantities by Engineer:—

Painter-work.—James McLeod, 45, Upperkirkgate	£14 1 4
Slater-work.—James Wilson, 79, Spring-garden	20 0 0
Carpenter-work.—Leslie & Hay, Fraser-road	176 2 10
Plumber-work.—John Blaikie & Son, Littlejohn-street	83 15 3
Mason-work.—James Gould, Gilcomston-park	49 0 0
Plaster-work.—Scott & Sellar, 7 and 9, Charlotte-street	16 18 4

ABERDEEN.—For macadamising Link's-street, and granite paving, &c., Belvidere-place, for the Town Council. Mr. Wm. Dyack, Burgh Surveyor, Town House, Aberdeen:—
A Leith & Son, King-street-road, Aberdeen, 2s. 1½d. per square yard.

ABERDEEN.—Accepted for the rebuilding of Balcavln Farm House, Old Meldrum. Mr. James Souttar, architect, 42, Union-street, Aberdeen:—

Mason.—George Hall, Aberdeen	£122 4 0
Carpenter.—James Webster, Old Meldrum	198 18 0
Slater.—Andrew Rhind, Inverurie	50 11 6
Plasterer.—Robert Moir, Inverurie	58 0 0
Painters and Glaziers.—J. Mason & Son, Aberdeen	11 19 0
Plumbers.—J. Blaikie & Sons, Aberdeen	32 7 6
Ironmongery.—N. Ramsay, Newcastle	6 15 0

ACCRINGTON.—Accepted for the erection of slaughterhouse, lairs, stables, &c., for the Accrington and Church Industrial Co-operative Society, Limited. Messrs. Haywood & Harrison, architects, Accrington and Lytham. Quantities by the architects:—

Mason.—Jas. Hy. Critchley	£2,520 0 0
Slater.—John Roberts	53 0 0
Carpenter and Joiners.—Co-operative Society	581 10 0
Plumber and Glazier.—Jno. Robinson	179 0 0
Ironfounders' Work.—J. W. Bridge	283 5 0

Painters' work not let. [All of Accrington.]

BILSTON (Staffs).—For the erection of school buildings, Hurst Hill, Coseley, for the Sedgley School Board. Mr. A. P. Brevitt, architect, Devonshire Chambers, Lichfield-street, Wolverhampton. Quantities by the architect:—

Marsh Bros.	£3,981	Bradney & Lloyd	£2,996
Wilcock & Co.	3,610	H. Gough	2,990
J. Butler	3,310	Dorse & Son	2,955
W. Crisp	3,157	T. Tildesley	2,819
T. Skett	3,080	J. Jones & Son, Sedgley, near Dudley*	2,790
Brookes & Sandy	3,022		

* Accepted.

BOROUGH GREEN (Kent).—For the erection of eight cottages. Mr. F. West, architect, Croydon:—

S. Iggleden	£1,545 0 0	Ansett & Son	£1,245 6 9
Allcorn & Sons	1,435 0 0	J. Clements, Maidstone (accepted)	1,166 0 0

BRISTOL.—For new warehouse for Messrs. Josiah Williams, 3, Queen's-lane, Bristol. Messrs. Crisp & Catley, architects:—

Easterbrook	£3,928	Hatherly	£3,487
Church	3,788	Beaven	3,400
Cowlin	3,723	R. Wilkins & Son	3,349
Walters	3,600	Humphries	3,333
Krauss	3,552	G. H. Wilkins	3,240

BUSHEY (Herts).—For the erection of a pair of semi-detached villa residences on the Melrose Mount Estate, for Mr. J. Cummings-Child. Quantities by Messrs. J. & A. E. Bull, Craven-street, Strand. Mr. Frederic W. Fryer, architect, London:—

Thomas Turner, Lim.	£2,567	Chas. Brightman, Watford*	£2,490

*Accepted subject to modifications.

CAHIR (Ireland).—For rebuilding shop and stores, for Messrs. S. Burke & Co. Mr. R. Fogerty, architect, Henry-street, Limerick:—

J. Holloway	£1,289	T. Hayes	£1,075
M. Hunt	1,160	J. Bowles	984

CAMBRIDGE.—For alterations to the residence of the keeper of the Shire Hall, Cambridge, for the Cambridge County Council. Mr. W. M. Fawcett, County Surveyor, 1, Silver-street, Cambridge:—

Redding & Son	£145 0	P. Banyard, Cambridge*	£104 5
W. Bell & Son	113 10		

*Accepted.

CANTERBURY.—For the erection of five houses and shops, St. Dunstan's. Messrs. A. & R. Pite & Sons, architects, Effingham House, Ramsgate:—

Seager	£2,693	Martin	£2,149
Cozens	2,398	Home	1,978
Amos & Foad	2,215	White	1,960

CARDIFF.—For the construction of retaining walls and abutment, also footway, for the Corporation. Mr. W. Harpur, C.E., Town Hall, Cardiff:—

Batchelor & Snowdon	£1,026 5 6	F. Ashley	£659 3 6
Pauling & Elliott	812 7 9	Ellis & Davies	630 0 9
A. E. Knight	751 18 5	E. H. Page	624 12 6
Wood & Son	748 16 6	H. A. S. Fraser, Cardiff (accepted)	620 18 3
J. Allan	745 1 4		

CARDIFF.—For forming, metalling, paving, &c., Splott-road and Walker-road, for the Corporation. Mr. W. Harpur, Borough Engineer, Town Hall, Cardiff:—

Wood & Son	£1,132 15 6	W. Best & Co., Cardiff*	£681 14 10
F. Ashley	922 13 11	James Rich	490 8 9
R. Smith	706 18 9		
Ellis & Davis	690 4 6		

*Accepted.

CARRICK-ON-SUIR (Ireland).—For the erection of forty-nine labourers' cottages, &c., for the Union Guardians. Mr. J. Mullins, surveyor, Carrick-on-Suir:—

P. Cullinan, Kilmacthomas ..£114 each for four cottages.
J. Dempsey, Cappoquin ..... 115 each for fifteen cottages.

CHAXHILL (Gloucestershire).—For the erection of a district church at Chaxhill, Westbury-on-Severn. Messrs. Medland & Sons, architects, Gloucester:—

W. H. Smith	£1,300	Wall & Hook	£1,130
Stephens, Bastow, & Co., Ltd.	1,299	A. King	1,095
D. C. Jones & Co.	1,150	J. Coleman	1,094
		W. Jones	1,075

COCKERMOUTH.—For pulling down old bridge and erection of a new stone bridge over the Ellen, for the Union Highway Authority. Mr. Wilson, engineer, Court House, Cockermouth. Quantities by Mr. J. B. Wilson:—

W. Studholme	£195 10 0	J. Allison & Son, Cockermouth*	£141 17 0
H. Graves	158 11 4		
J. W. Pickthole	155 0 9		

*Accepted.

COVENTRY.—For additions, &c., to Spon-street school buildings, for the School Board. Messrs. G. & J. Steane, architects, 22, Little Park-street, Coventry:—

	Extension to Buildings.	Extension to Playground.
J. Worwood	£1,178	£912
Hallam & Co.	1,175	940
C. G. Hill	1,006	974
C. Garlick	995	895
A. A. Wincott	976	990
C. Haywood, junr. Coventry*	890	960

*Accepted.

CROYDON.—For the erection of a cottage, Pitlake, for the Town Council:—

Trappit & Batley	£364 12	Bridger (withdrew)	£295 0
W. Smith	325 0	R. Peters, Banstead*	295 0
A. Bullock	315 0	Tidy	250 0

* Accepted.

ENFIELD.—For the erection of public swimming bath, caretaker's cottage, &c., at Enfield Lock, for the Enfield Local Board of Health. Mr. W. Kitteringham, engineer and surveyor. Quantities by Mr. R. J. Beale, F.S.I., 9, Victoria-street, Westminster, S.W.:—

C. Marriott	£3,464	W. Lawrence	£2,668
J. Coldswells & Son	3,044	E. A. Fairhead & Son	2,560
E. C. Woodhead	2,998	W. Gardner, Waltham Abbey (accepted)	2,361
C. White	2,777		

GRIMSBY.—For the erection of six almshouses, Wheelsby-street, for the Fishermen's and Sailors' Harbour of Refuge Almshouses Trust:—

Jno. A. Thomas	£990 0	H. A. Weston	£780 0
W. G. Pickering	807 0	T. H. Burnett, Corporation-road, Grimsby*	720 0
Geo. Willingham	790 4		
G. H. Cross	781 16		

* Accepted.

GUILDFORD.—Accepted for building stabling and conservatory, in connexion with residence in course of erection in the Parish of Stoke, for Mr. C. J. Scott. Mr. Robert Clamp, architect, "The Retreat," Woking:—
Robert Pink, Godalming £422 15 0

HASTINGS.—For alterations and additions to house, Wellington-square, for the Union Guardians. Messrs. Jeffery & Skiller, architects, 5, Havelock-road, Hastings:—

J. Lester	£596 0	J. Simmonds	£519 0
E. Gutsell	569 2	D. Snow	506 0
W. Small	547 0	Padgham & Hutcheson	476 0
A. H. White	534 0	S. Starr	467 0
P. Jenkins	525 0	J. Geary, Hastings*	449 3
Barter & Gasson	525 0		

* Accepted.

HOLY CROSS.—For alterations to Holy Cross Catholic Church. Mr. P. J. Byrne, architect, Bristol:—

Church	£4,093	Hatherly & Carr	£3,380
Forse	3,800	Humphreys	3,100
Beaven	3,640	Wilkins & Sons	2,994
Hayes	3,579		

LLANDAFF (S. Wales).—For widening and reconstructing Church-road, Lisvane, for the Highway Board. Mr. Jas. Holden, Surveyor, Belthorn, Llandaff:—

Wood & Son	£664 17 0	C. Watkin	£337 4 5
W. Cox	521 7 0	Eli Rees	336 18 1
Bachelor & Snowdon	516 14 8	John Thomas	301 14 1
F. Ashley	509 0 3	Ed. Moses, Rudry, Glam. (accepted conditionally)	298 11 8
A. Knight	406 12 8		
T. J. Davies	350 7 2		

LONDON.—For the erection and completion of an Isolation Hospital for Infectious Diseases, for the Willesden Local Board. Messrs. Edmeston & Gabriel, 42, Old Broad-street, E.C.:—

Lascelles	£16,511 5	Carmichael	£14,645 0
W. Shepherd	15,808 0	Scharlen	14,510 17
Yerbury	15,400 0	Young & Lonsdale	14,448 0
Lorden & Son	15,275 0	Godson & Sons*	14,278 0
Cowley & Drake	14,891 0	Neave & Neave	12,870 0
Lawrence & Son	14,856 0		

* Accepted subject to slight modification.

LONDON.—For pulling down and rebuilding Nos. 141 and 142, Fenchurch-street, E.C., for Mr. Ebenezer Maxim. Mr. Ebenezer Gregg, architect. Quantities by Messrs. S. Young & Brown:—

Mowlem & Co.	£8,000	Williams & Sons	£7,509
Ashby & Horner	7,677	Holland & Hannan	7,500
Pattinson & Co.	7,530	W. Shepherd	7,461
Bywater & Sons	7,512	B. E. Nightingale, Albert Embankment (accepted)	7,250
Hall, Beddall, & Co.	7,510		

LONDON.—For alterations and decoration to the "Princess Royal," Paul-street, Finsbury, for Mr. A. F. Byass. Mr. A. Jackson, architect:—

Durnford Bros.	£170 4 0
Hewitt, Chiswell-street, E.C. (accepted)	169 12 6

LONDON.—For reinstating after fire the backs of houses, Nos. 5, 6, 7, and 8, Jeffrey's-square, St. Mary-axe, City. Mr. Herbert Riches, architect and surveyor, 3, Crooked-lane, King William-street, London, E.C.:—
Ashby & Horner* £407 0 0

*Accepted with slight modification.

LONDON.—For bar fittings and pewtering at the "Royal Oak," Lingham-street, Stockwell, S.W., for Mr. R. K. Arnold. Mr. A. Hawkins, architect, Red Lion Brewery, Lower East Smithfield:—

Ridd & Bailey	£196 10 0	H. & F. Warne*	£194 0 0

* Accepted.

NEWLYN (Cornwall).—For the erection of offices at Churchtown, Paul, for the Local Board. Mr. Henry Maddern, junr., architect, Belle-Vue House, Newlyn, Paul, Cornwall:—

For the Whole Work.

J. S. Tregenza £276 0 0

Mason Work only.

J. S. Tregenza* £196 0 0

Carpenters' Work.

T. James	£99 0	C. M. Richards	£81 10
W. H. Wills	98 13	J. James	78 5
A. Pasley	98 10	J. Tucker	78 0
J. E. Hosken	95 0	T. F. Harvey*	74 10

* Accepted.

PARKSTONE (Dorset).—For forming roads, &c., on the Sandecotes Estate, for Messrs. Overbury & Hankinson. Messrs. Hankinson & Son, surveyors, Richmond-chambers, Bournemouth:—

W. Saunders & Co.	£975 15 0	Mark Loader, Bournemouth (accepted)	£456 5 0
T. Budden	570 17 6		
J. White	547 10 6		

PENARTH (Wales).—For widening and improving Windsor-road, for the Local Board. Mr. J. Court, Surveyor, Local Board Offices, Penarth:—

Contract No. 1.

Batchelor & Snowden	£622 18 10	John Mackay	£473 7 4
Richards	613 10 2	Thomas Rees, Ely*	442 14 8

* Accepted.

Contract No. 2.

Batchelor & Snowden	£303 0 0	Richards	£231 3 4
John Mackay	243 10 0	Thomas Rees, Ely*	218 11 0

* Accepted.

PRESCOT (Lancs.). — Accepted for the enlargement of boys home at the workhouse, Whiston, for the Union Guardians. Mr. Jas. Gandy, architect, Masonic Buildings, St. Helens:—
R. H. Davies, Boundary-road, St. Helens £1,370 0 0

RHAYADER (Wales). — For the erection of hotel, stables beer-stores, bars, boundaries, and water-supply at Llanfadog, near Rhayader, Elan Valley, for Messrs. Williams Bros. Mr. Telfer Smith, architect, Market-hall Buildings, Builth Wells:—

G. Jore	£4,000 0 0	S. W. Deakins	£2,837 0 0
J. D. Williams	3,195 0 0	Henry Price	2,700 0 0
T. Price	2,920 0 0	A. Meredith, Newbridge-on-Wye*	2,600 0 0
J. Breeze	2,877 4 4		
D. B. Hamer	2,840 0 0		

* Accepted.

ROCHDALE.—For the construction of 1,302 yards pipe-sewers &c., for the Wuerdle and Wardle Local Board. Mr. J. Tertius Wood, C.E., Butt's-chambers, Rochdale:—

William Hardy	£2,000 0 0	Thos. P. Willan, Manchester*	£1,439 15 2
S. Johnson	1,831 9 3		
J. C Shaw	1,560 11 7		

* Accepted.

STOCKPORT.—For laying 160 yds. of 12-in. pipe sewers, Edgeley, for the Corporation. Mr. Jno. Atkinson, C.E., Borough Surveyor, St. Peter's-gate, Stockport:—

Walker	£119 10 0	Dawson & Walker	£64 12 6
Worthington & Pownall	75 4 0	Hayes Bros., Stockport (accepted)	62 14 10
J. Broadhurst	72 19 9		

STREATHAM.—For outbuildings and greenhouse, Streatham Cemetery:—

J. Carmichael	£1,000 0	W. Cooper	£695 0
Jas. Smith & Sons	965 0	A. Wallis	598 0
Peacock Bros.	895 0	J. Dickeson	586 0
W. H. Lascelles & Co.	812 0	A. Yeoman	557 7
R. E. Clarke	775 0	A. B. Chirgwin	555 15
Syme & Duncan	695 0	T. Linfield	547 0
Somerford & Son	648 0	Seath & Harris*	514 0

* Accepted.

WAKEFIELD. — Accepted for additions and alterations to Tetley House, Kirkgate, for the Union Guardians. Mr. Frank Massie, Surveyor, Tetley House, Kirkgate, Wakefield:—

Bricklayers and Masons.—T. & G. Wilson, Wakefield	£272 14 0
Joiners and Carpenters.—Horsnell & Heald, Ossett	115 0 0
Plumber, &c.—Thos. Ellis, Wakefield	66 0 0
Ironfounder.—S. Atkinson, Wakefield	74 0 0
Plasterer.—J. Platts, Wakefield	23 0 0
Slaters.—Pickles Bros., Leeds	24 14 0

WAKEFIELD.—For the construction of a main pipe sewer for the Lincoln-street district, Alverthorpe, for the Union Rural Sanitary Authority. Mr. Frank Massie, C.E., Tetley House, Kirkgate, Wakefield.

Squire Booth	£466 9 6	T. & G. Wilson	£362 10 2
Garforth Bros.	412 19 3	Matthew Arundel,	
Aliffe Bros.	396 5 9	East Ardsley*	337 1 8

*Accepted.

WARRINGTON.—For forming and paving Ernest-street and part of Hamilton-street, for the Corporation. Mr. T. Longdin, Borough Surveyor, Warrington :—

F. T. Bennie	£216 18 1	Wm. Heaton	£213 0 0

WHITSTABLE (Kent).—For the erection of school buildings, Oxford-street, for the U.D. School Board. Mr. J. Lawson, architect, Whitstable :—

T. W. Porter	£830 0	R. Seager	£649 10
T. Cornelius	670 0	Amos & Foad, Whitstable (accepted)	619 0
W. R. Nuested	664 0		

WINCHESTER.—For the erection of new buildings at Castle-hill, Winchester, for the Southampton County Council. Mr. James Robinson, County Architect and Surveyor, Winchester :—

Brown, Son & Blomfield	£12,583	F. H. Kingerlee	11,492
Higgs & Hill	12,340	J. H. Corke	11,448
Fielden & Son	12,325	Stephens, Bastow & Co., Ltd.*	11,298
Carter & Son	£11,900		

*Accepted.

WOLVERHAMPTON.—For the erection of new residence and stabling, for Captain Alex. McBean. Mr. Joseph Lavender, architect, Wolverhampton :—

H. Willcock & Co.	£2,525	G. Cave	£2,397
H. Gough	2,499	Ben. Guest (accepted)	2,350

[All of Wolverhampton.]

Water-works, Tetbury.—We are asked to correct an error which occurred in our list of Tenders for construction of water-works, Tetbury (see last week's *Builder*, p. 148). The Tender of Mr. Francis Brown, for engine-house and reservoir, should have been £792 instead of £972.

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J. J. I. R. (too small).—A. S. (should have stated amounts).—W. & J. B. B. (ditto).—B. J. D. (too late: next week).—T. M. O'Connor (too small).

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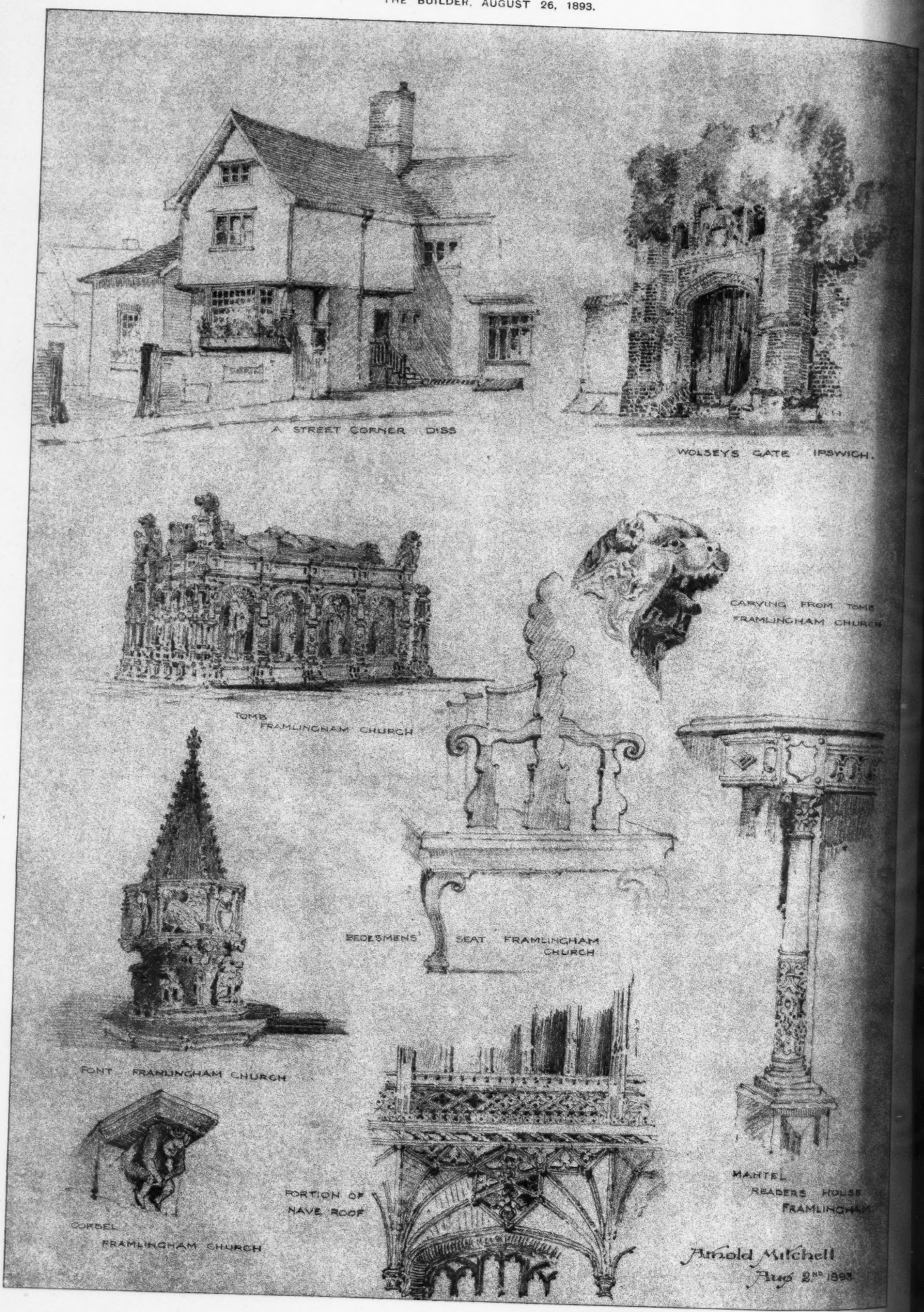

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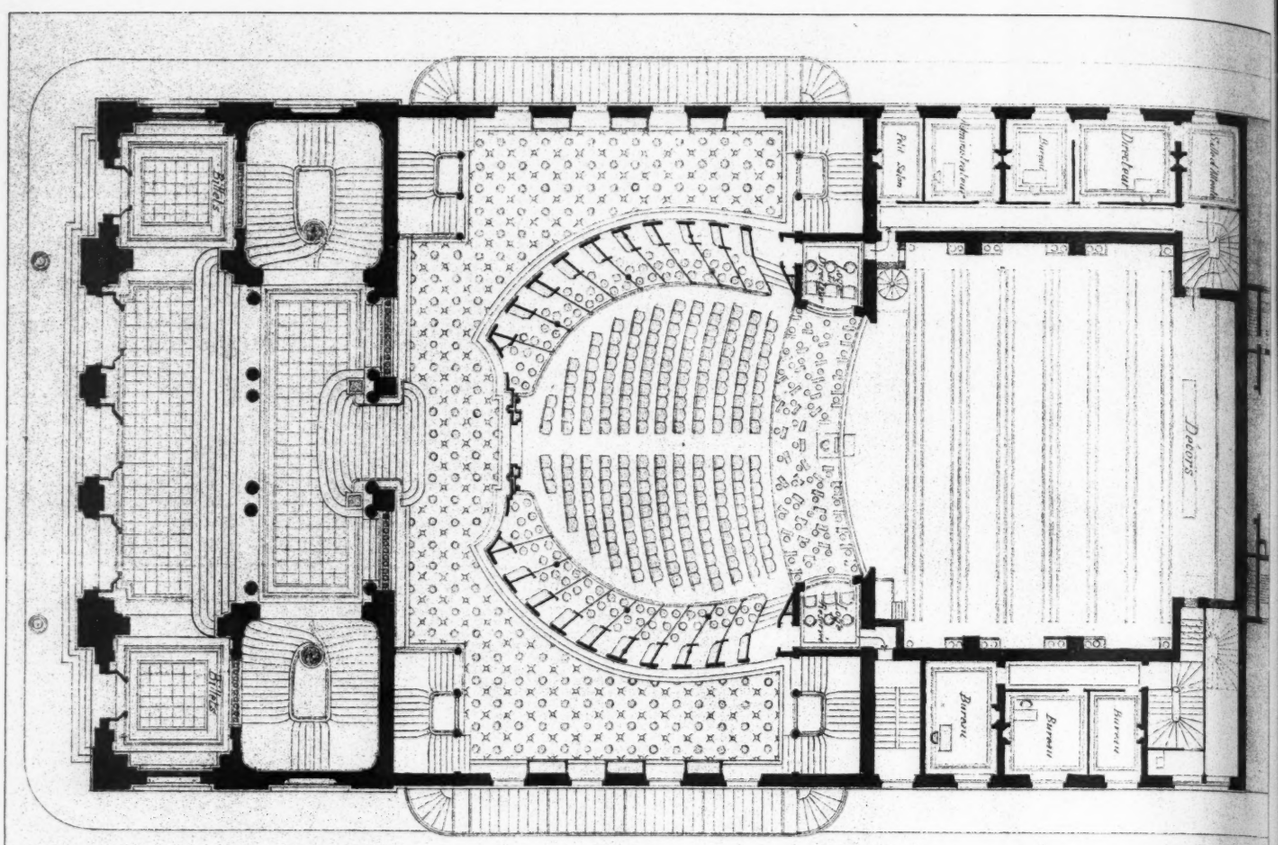
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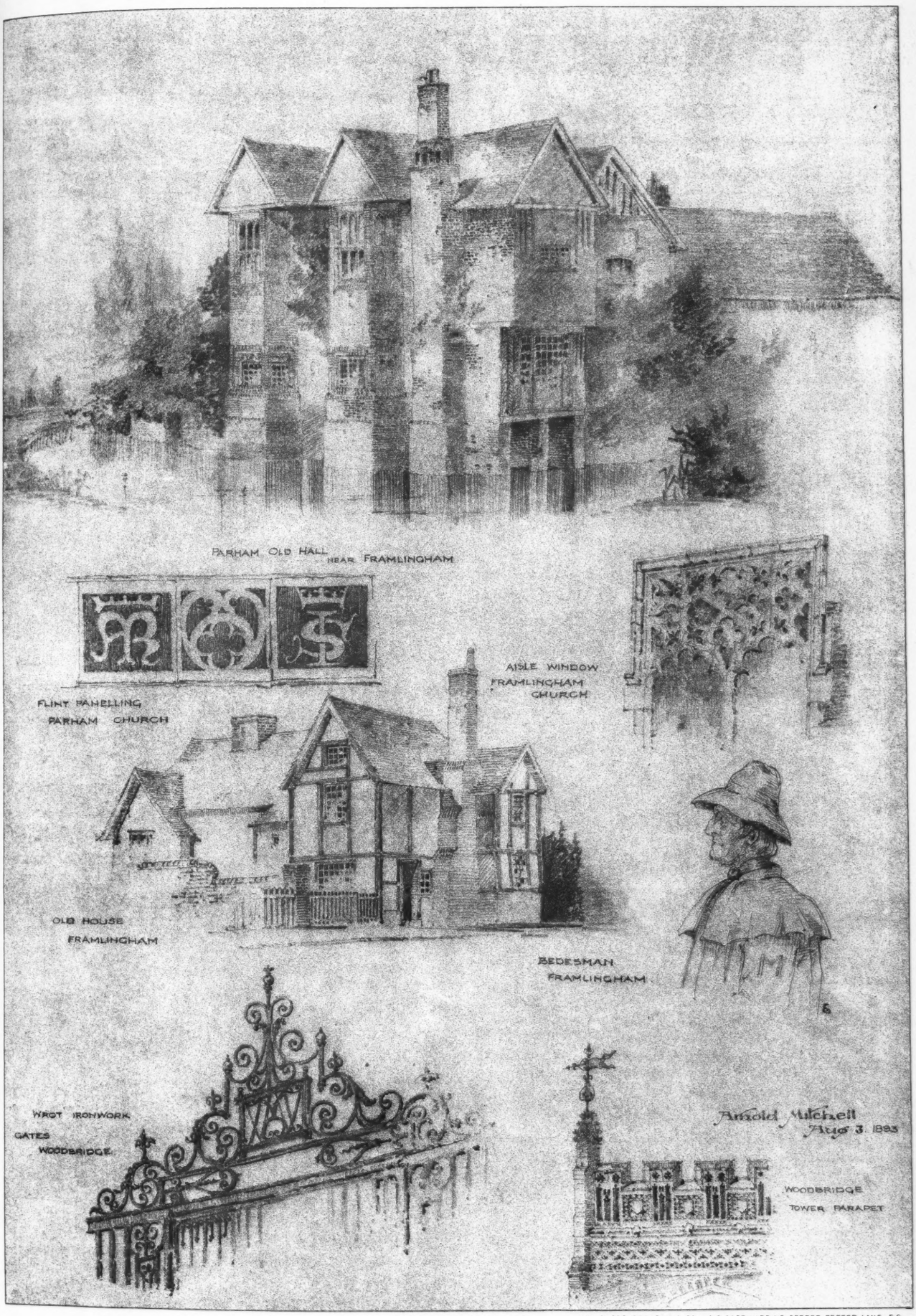

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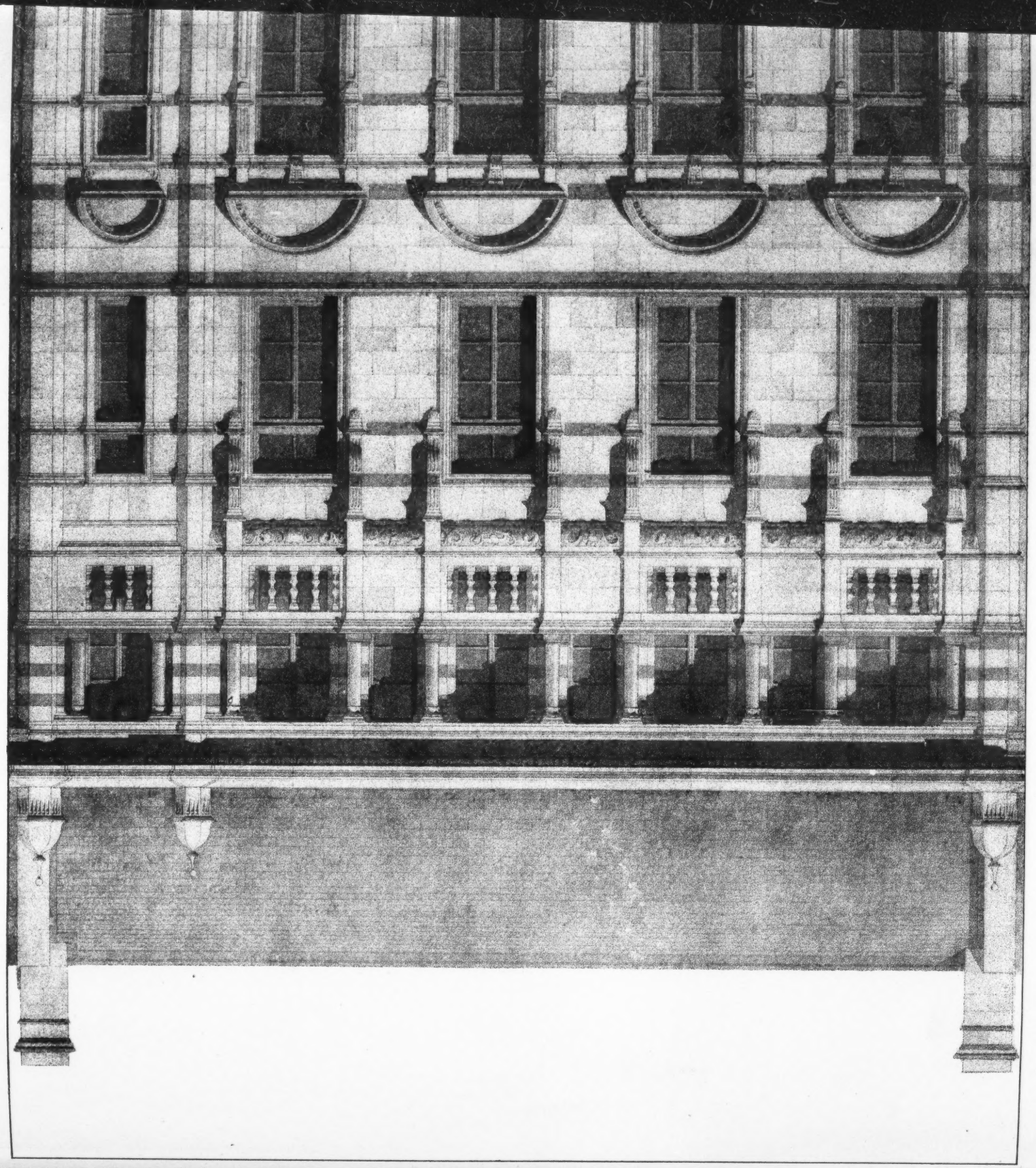
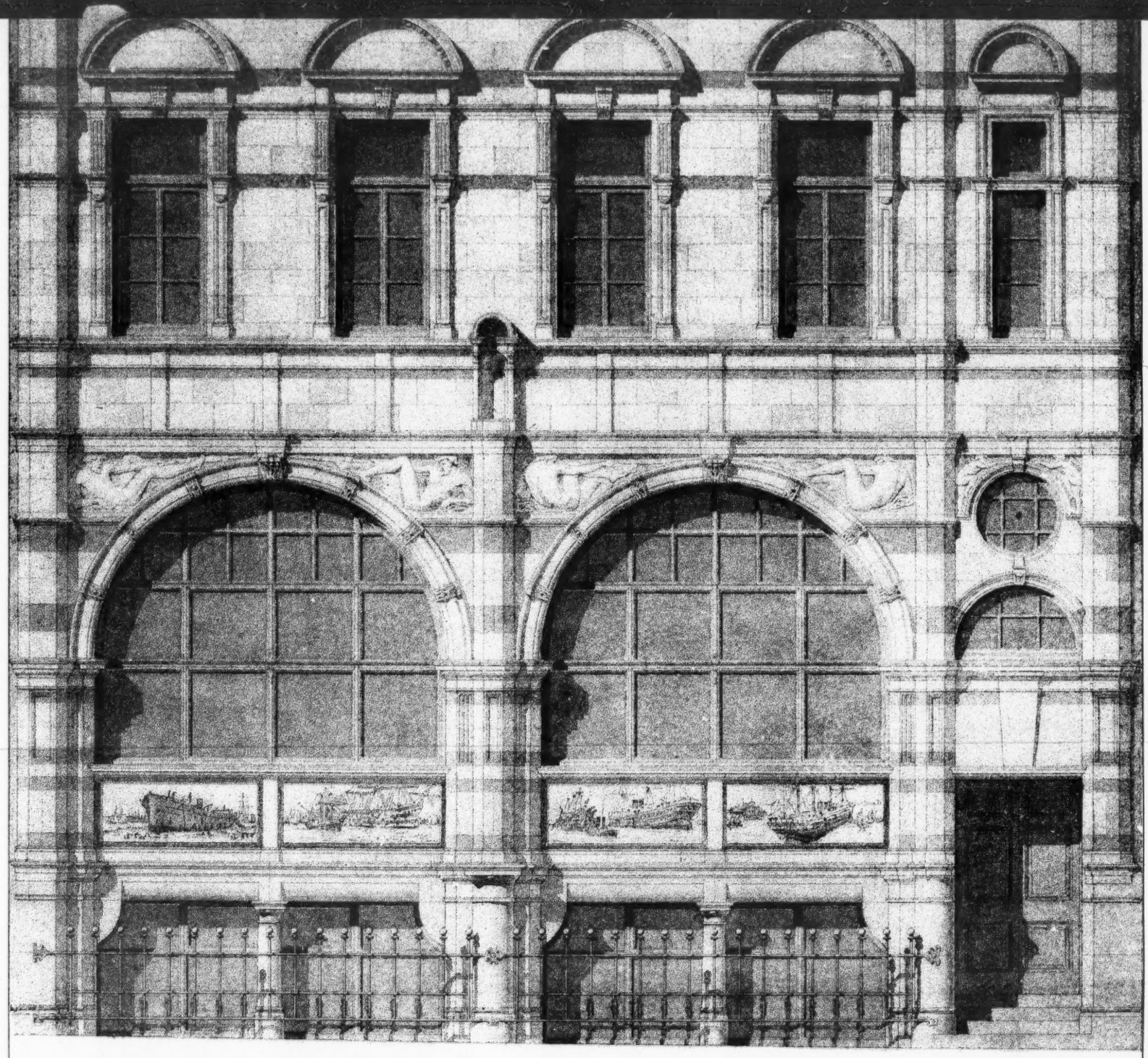
ÉRA COMIQUE, PARIS.—M. Louis Bernier, Architect

THE BUILDER, AUGUST 26, 1899.





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